

2008

Heuristic Health Resource Referral (H2R2) Engine

Duy Vo

San Jose State University

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Vo, Duy, "Heuristic Health Resource Referral (H2R2) Engine" (2008). *Master's Projects*. 81.

DOI: <https://doi.org/10.31979/etd.5yws-s6wx>

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Heuristic Health Resource Referral (H2R2) Engine

A Writing Project

Presented To
The Faculty of the Department of Computer Science
San José State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science in Computer Science

by

Duy Bao Vo
duybvo at gmail dot com

Committee Members:

Dr. Robert Chun, Advisor
Professor of Computer Science, San José State University

Dr. Sean Laraway
Assistant Professor of Experimental Psychology, San José State University

Dr. Teng Moh
Professor of Computer Science, San José State University

ACKNOWLEDGEMENT

The idea to employ fuzzy logic in a rule engine was inspired by Dr. Robert Chun. In addition to his guidance throughout the project, he was helped keep the project on track.

Dr. Sean Laraway was instrumental in developing the testing methods and analyzing the data. His domain knowledge and patience proved invaluable. His explanations were pedagogical and he tirelessly worked to help plan the logistics of the experiment.

Dr. Teng Moh was very helpful in setting up the technical infrastructure to execute the experiment. Dr. Susan Snyckerski volunteered her time to help analyze the data. Chan Chan Tran, Jonathan Boyajian, and Patrick Cravalho helped execute the experiment.

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ABSTRACT

Searching for health resources is difficult for many individuals because it requires domain knowledge and understanding of search engines techniques. Our system proposes a paradigm shift whereby users provide as much or as little information as they feel comfortable, and we endeavor to match them with relevant health resources. The system first attempts to identify risk factors through a heuristic engine that employs fuzzy logic and then searches for health resources based on the user's profile. We aim to unburden the user from having to understand complex health information and sometimes esoteric search techniques. Our preliminary findings show that a fuzzy-based rule engine has utility for determining alcohol suggested care and finding health resources for both alcohol and cigarette dependencies.

1 OVERVIEW

1.1 Motivation

There are a myriad of health resources available to individuals, but searching for them is still a challenge for many [1]. There are numerous applications and websites that maintain information about health resources like clinics, outreach offices, government-sponsored programs, and support groups. However, current systems have many shortcomings including lack of a public API for querying and updating information, a non-intuitive interface, and inability to utilize domain expertise. We focus on the fact that these systems do not effectively connect clients with resources because they require that clients know how to search for resources.

In a 2003 research proposal, of the 109 million Americans using the internet, sixty-six percent claim to have sought health-related information [2]. While the number of Americans looking for health-related resources online continues to grow, the overall effectiveness in looking for health resources is lacking. In the aforementioned study, the authors reported an alarming result that “This study determined that more than two-thirds of the top ten results on AlltheWeb and MSN do not return relevant results. Less than half of the results from the best performing search engine studied, Google, were relevant.” [2].

While there are many endeavors to simplify and help improve the search process, we propose a different paradigm. We believe that by applying certain heuristic approaches, it is possible to build a viable and reliable expert system that helps individuals find health resources that are relevant to them.

1.2 Introduction

The Heuristic Health Resource Referral (H2R2) Engine is an expert system that aims to change the way individuals can connect with health resources. It employs a subcomponent of weak artificial intelligence that is as capable of finding health resources based on a user’s profile as a case worker and aims to pass a limited version of the Turing test for machine intelligence [3]. Already, there are many technologies for enabling users to better execute searches, some of which leverage domain expertise, as in a proposed a Health Information Query Assistant (HIQuA) system [4]. Any systems such as ours will capture domain expertise into a rule engine and will also benefit from fuzzy logic,

because there are a myriad of rules with varying importance, may be contradictory, and are inherently vague. The different health policies (at varying level of governments like municipal, county, state, and federal) combined with various charters for different health organization present a multipolicy paradigm that is challenging to model. Hosmer *et al.* has argued that fuzzy logic is a viable solution to representing these security policies in such an environment [5]. Shapiro also composed an overview of feasibility studies on applications of fuzzy logic to the insurance industry [6].

There are several notable studies on applications of fuzzy logic to the health industry; Costa *et al.* argued that fuzzy logic is a modeling framework for evaluating quality-of-life for disabled individuals [7], Kentel *et al.* proposed a fuzzy logic-based modeling framework for health risks [8], and Sproule studied how fuzzy logic can be implemented in a drug delivery system [9]. All these systems have inherent uncertainties and are guided by many different policies, making them suitable for fuzzy logic.

1.3 Objectives

The goal of this project is to engender a new focus on providing health information by demonstrating the utility of fuzzy logic as an integral component of a health-based decision support system (DSS). While DSS are commodities in many fields, their existence in the health industry is limited, and there are none that look for patterns by applying machine intelligence.

Our work aims to overcome two major challenges in delivery health services: 1) removing the need for individuals to learn how to effectively search or health resources or rely on search engines and word-of-mouth to deliver resource information and 2) demonstrate how to build a health resource database that has the reliability of an enterprise-class systems with the usability and locality-oriented support of a local health site. The main effort of our project will be given to addressing Objective 1 with significant focus on tobacco and alcohol dependency.

This system aims to provide a seamless experience for individuals to access health information at this at numerous levels like municipal, county, regional, state, and federal. By capturing domain expertise to find relevant health resources, the inability of web search engines and individual search capabilities will no longer matter. The result is our ability to address the following scenario:

1. A user registers for an account with the system.

2. The user provides whatever information he is comfortable with. The information ranges from financial data, location, primary languages, and various health indicators. The user may also elect to answer various questionnaires.
3. The inputs from the user are analyzed and, if appropriate, assigned fuzzy values.
4. These fuzzy values are fed into a set of fuzzy rules that, in consort with other information, determine a list of health resources.
5. The user may browse the list of resources recommended by the system as well as the results of the various rules.

The goal of the expert system is to utilize a given rule set to determine health resources for individuals. A blind test will be conducted whereby one group of individuals is asked to find health resources using any number of search engines and another group will use our system. Given the resulting list of health resources and information about the users, at least one domain expert in the area of tobacco abuse and alcoholism, or health resources should validate that the resource referrals from our system are more useful.

2 LITERATURE REVIEW

2.1 Problem Statement

In 2006, a collaborative endeavor among the Community and Rural Development Institute, Cornell University, and other organizations, identified several the health challenges and opportunities for improvements. In addition to notable best practices and failures, the report contains many recommendations including a database engine from which users can query for health resource eligibility. Such a database is immensely valuable, but still remains difficult to employ because it requires users to be able to articulate what they are searching for. The ideal solution should not place such requirements on users [1].

Our system aims to provide a solution whereby individuals may connect to an electronic repository of health information and receive information about various health resources. We propose to address this challenge by replacing the often error-prone step of querying for health resources to an automatic referral system based on an individual user's profile. We make use of fuzzy logic because of the often imprecise and sometime contradictory nature of predicting health resource needs.

The cornerstone of H2R2E is its ability to take fundamentally vague, incomplete, imprecise, and often conflicting policies, rules, and observations to generate widely-acceptable results. Fuzzy logic is well-suited for such inherently vague and imprecise reasoning. Since its inception in 1965, there have been a myriad of attempts to apply fuzzy logic to improve various expert rule systems [10]. Our system is especially suited for fuzzy logic because of the inherent conflict in a multi-policy setting associated finding health resources for individuals.

2.2 Fuzzy Logic

Fuzzy logic is a derivation of fuzzy set theory, which was introduced by Dr. Lotfi A. Zadeh. In fuzzy set theory, the members of the set have degrees of membership as opposed to the classical construct where an element is either in a set or is not in a set; in fuzzy set theory degrees of membership is within the inclusive range $[0, 1]$ where 0 represents absolute false or no membership and 1 represents absolute truth or full membership. The membership degree is determined by the fuzzy membership function, which is a generalized indicator function of classical set theory, which maps a particular member to a

membership value within the range [0, 1]. Several concepts are fundamental to the application of fuzzy logic and are defined explicitly [11]:

1. A fuzzy set is an otherwise classical set on a domain with fuzzy members which can be mapped to the range [0, 1] by the fuzzy membership function μ .
2. A fuzzy set intersection is the intersection between two fuzzy sets and implemented as the minimum of the values of the fuzzy membership functions.
3. A fuzzy set union is the union between two fuzzy sets and implemented as the maximum of the values of the fuzzy membership functions.
4. A fuzzy set cardinality is defined as the sum of all the fuzzy membership values.
5. A fuzzy rule is an "If-Then" rule with fuzzy linguistic values.
6. A fuzzy linguistic variable is a variable employed within fuzzy logic where each fuzzy variable is associated with a word or phrase rather than a number. Traditionally, these fuzzy linguistic variables are adjectives which describe a value (i.e. "cold" if relating to temperature). However, additional modifiers can also exist in the form of adverbs (i.e. "very cold").
7. A fuzzy membership function is a generalized indicator function which maps members of a fuzzy set to the real number space within the range [0, 1]. Different types of fuzzy membership functions exist, including triangular membership functions, Gaussian membership functions, and trapezoidal membership functions. Custom fuzzy membership functions are also possible, and need not be symmetric. However, fuzzy membership functions must always have the range [0, 1].

Fuzzy logic was constructed to deal with inherent vagueness in many domains where existing knowledge does provide exact details or measurement or description of information is not exact. By taking expert and common knowledge captured as a collection of "If-Then" rules, it is then possible to build an expert system for decision support.

2.3 Alternatives

H2R2E is an application whereby individuals will be provided information about pertinent health resources based on their profile, thus unburdening the population who are not well acquainted with search engines, written English, or medical jargon from having to search for health resources. Querying for health-related information on the internet is an important activity for millions of

individuals. Search engines require a "good" query for any possibility of retrieving relevant results. Unfortunately, many users are inept at formulating such queries; for example, a user looking for a health-related subject of "Are there natural substitutes for the hormone replacement therapy Prempro?" has used the query "natural hrt". Such shortcomings are further exacerbated by the individual's lack of familiarity of the vast medical vocabulary. Zeng *et al.* developed HIQuA to recommend alternative or additional query forms. Three characteristics of the average user query for health-related information were determined [4]:

1. Queries are short on average, usually no more than one or two words
2. Most terms can be mapped to concepts in medical vocabularies
3. Familiar terms and concepts employed for queries are usually inaccurate and do not properly describe the desired information

Zeng *et al.* proposed a recommendation scheme whereby the query is mapped onto one or more concepts using the Unified Medical Language System (UMLS), and the most appropriate concepts relating to those concepts are selected. Fuzzy logic is employed to determine the most relevant concepts by scoring relationships of terms and concepts (i.e. "heart attack" and "ischemic heart disease"). Intersections of fuzzy membership functions are used to determine if a particular concept is relevant in all of the information sources (i.e. thesauruses) whereas unions of fuzzy membership functions are used to determine if a particular concept is relevant in any of the sources. The semantic distance is then calculated as a linear combination of the crisp results from the intersection and union calculations, with more weight on the intersection to determine the recommendation for the user query. While user satisfaction was not statistically significant between the recommendation and non-recommendation groups (less than 5% increase in satisfaction with the recommendation group), the query success rate was much more (almost 12%).

2.4 Prior Research

Fuzzy logic was applied successfully to assist in determining health policies as demonstrated by Chernichovsky *et al.* [12]. They argued that fuzzy logic is a viable method to achieve various types of goals for the health system including equity in care, macroeconomic efficiency, and client satisfaction in service and care received. Specifically, they build an expert system employing fuzzy logic to help solve challenges of financing a health system. They began by composing six tables that aggregates the ranking of the various aspects of the financing of

health resource goals based on different health system goals using domain expertise and common knowledge. Based on the twenty-four policy choices, split into six categories, a collection of fuzzy linguistic rules were developed in the following form with OR, AND, AVR (for average) operators. An example is:

If equity is low

- OR macroeconomic efficiency is low
- OR production efficiency is low
- OR client satisfaction is low

The health care system is poor

Table 1 - Sample fuzzy linguistic rule for health financing

Chernichovsky *et al.* then applied the centroid calculation with weighted values for the twenty-four different policy choices to determining the overall value of a particular scheme and concluded. Based on their modeling, they presented a proposal similar to a German-style health system with policies for all six categories.

Numerous studies have begun exploring whether fuzzy logic is a viable tool for modeling multi-policy paradigms including security and hospital-related systems whereby different rules are considered for any decision. Consider the challenge of classifying the sensitivity of patient information; for example a patient's name, address, and insurance company information might be classified as having a low privacy rating whereas the medical record might be given a high privacy rating. Furthermore, it is highly desirable to determine the integrity of a particular given fact (i.e. "Patient A will undergo surgery for breast cancer in Operating Room 10 (OR-10) at 8 a.m. on June 1, 1993."). Different aspects of the integrity check can be considered, including source, pedigree, and logical constraints, with associated fuzzy linguistic variables to express how high the integrity rating should be [5]. These findings provide the foundation for determining 1) the legitimacy of a particular health resource, 2) the utility of a particular resource to an individual, and 3) whether or not an individual qualifies for the services provided by that resource.

In order to determine the utility of a particular resource, it is imperative that we first understand the needs of the individuals. At the bare minimum, we must establish the individual's health needs, driven partly by the health risks that are inherent to him and his surroundings. Traditionally, modeling various health risks have resided in the realm of statistical methods. However, inherent imprecision from attempts to aggregate knowledge from different sources (domain expertise, subjective interpretation of often incomplete data, and measurement) lend the system well to analysis with fuzzy methods. Kentel *et al.*

applied a probabilistic-fuzzy approach to analyzing the health risk of contaminated water [8]. They differentiated the two main sources of imprecision: 1) inherently random variables and 2) non-random uncertainties like scarcity of information. Different aspects of exposure were considered including ingestion, inhalation, and dermal contact. The uncertainty variables of the cancer potency factor for ingestion, inhalation, and dermal contacts in addition to the contamination of tap water are modeled as fuzzy variables. In defining the probabilistic-fuzzy risk assessment (PFRA) equation, Kentel *et al.* employed an alpha-cut on their pre-defined fuzzy sets. They aggregated gathered information to generate four triangular fuzzy membership functions to determine the cancer potency factor (CPF) for ingestion, inhalation, dermal contacts, and contamination of tap water. These values were used in conjunction with their probabilistic model to determine the overall risk. We can base our modeling techniques on Kentel *et al.*'s work to determine the risk factor for any particular health issue, which is the first step in determining the needs of an individual.

Another concept in risk management is the precautionary principle, defined as "when potentially dangerous effects deriving from a phenomenon, product, or process have been identified, measures to prevent them should be adopted, even where scientific evaluation does not allow the risk to be determined with sufficient certainty." Concepts of uncertainty of the likelihood of an event, desired level of protection, or prevention are at the core of precautionary principle. Here, risk is defined as the product of the magnitude of the damage and the likelihood of a particular event. Based on a predefined acceptable risk, the actual risk can be calculated as defined above; if the calculated risk is less than or equal to the acceptable risk. Since the likelihood of any particular event is rarely certain and can be expressed in fuzzy linguistic terms like "low", "medium", or "high" likelihood. Based on the appropriate fuzzy membership functions, the risk of underestimating the risk can be further minimized. Based on the defuzzification value, it can be determined if precautionary measures should be taken even when the calculated risk is less than the predefined acceptable risks. In instances where H2R2E needs to determine whether or not a particular individual is at risk of a particular condition, the precautionary principle might be applied. This is especially true if the cost of implementation for such measures is low. For instance, the precautionary principle is a likely candidate for assisting low-income families in certain urban areas gain access to healthy and fresh food. Such an implementation would prevent a diabetic outbreak at a relatively low cost and increase the overall health of the general public [13].

Once the needs have been established, we can then proceed to determine the utility of a particular health resource. Warren *et al.* proposed deploying a health-based decision support system integrated with various components like an Electronic Medical Record (EMR) system to provide "just in time" health information vital to a clinical setting. Such systems have been demonstrated to improve effectiveness, lower costs, and reduce adverse events. Warren *et al.* developed the Care Plan On-Line (CPOL) system to help general practitioners develop a care plan for the chronically ill. In developing these guidelines, several major types of uncertainty that arises [14]:

1. Lack of information that is relevant in developing the guidelines
2. Guidelines are inherently non-specific and may refer to "other conditions" or "other risk factors"
3. Intrinsic probabilistic nature of health because no set of conditions unequivocally define a particular medical condition
4. Inherent vagueness in the language of the guidelines including "strongly suggested"
5. Conflicting guidelines because multiple guidelines may apply to a set of symptoms
6. Subjective interpretation of clinical data, lab results, and patient assessment

The system endeavors to create triggers based on a patient's health data. We can aggregate many different rules and expert observations to determine how useful a particular health resource will be to an individual, given the individual's profile. For our project, we simplify the implementation by primarily focusing on alcohol and drug dependency.

Shapiro presented an application of fuzzy logic to the insurance industry. A c-means algorithm was employed to cluster groups of patterns together whereby variances within the clusters are minimized and variances between clusters are maximized [6]. This construct allowed for the classifications of individuals into different groups whereby patterns can be discovered within these classifications. Our system should employ similar methodologies for classifying individual profiles into various groups whereby certain health resources closely associated with a pattern or group of patterns based from the profile classification will be identified. With respect to the precautionary principle, there are instances when actions must be taken when the calculated risk is less than the acceptable risk. This happens when the likelihood cannot be known precisely, or there is an uncertainty that could place the calculated risk higher than the predefined

acceptable risk. Using fuzzy logic, it is viable to identify potential groups of patients exhibiting similar attributes and help find resources that are appropriate based on the individuals' profile.

A thorough study by the Leal Costa *et al.* looked at applying fuzzy logic to the study of public health [7]. They cited efforts to develop metrics of both morbidity and mortality as indicators of health. In the study of epidemiology, uncertainty abounds for several reasons, including:

1. A particular disease may manifest itself different among different individuals
2. The mapping of disease to symptoms is inherently many-to-many, thus complicating the diagnosis
3. Individuals with several disease might exhibit many different symptoms, thus complicating the diagnosis
4. Well-adopted terms for describing diseases are often linguistic in nature, and therefore inherently vague

In their paper, Leal Costal *et al.* contrived three fuzzy variables:

1. Social activity (S) to describe the activities associated with one's age and social role
2. Mobility (M) to describe the ability for one to travel from one point to another
3. Physical activity (P) to describe the ability for one to control one's movement, for example, walking and stopping.

Based on expert knowledge gathered from questionnaires, 100 fuzzy rules were developed and formulated to provide an output as the functional disability (D) of an individual with the form:

If S is S1 and M is M1 and P is P1, then D is D1

Also

...

Also

If S is Si and M is Mj and P is Pk, then D is D1

Table 2 - Sample fuzzy linguistic rules for functional disability

Mamdani's inference rules were employed to define the fuzzy relations, and the max-min inference rule was used to calculate the functional disability for each of the 100 rules. Then, the crisp value was calculated to determine the overall functional disability of the individual.

Another group of expert rules stem from health policies. For example, the emerging concept of pay for performance (P4P) is setting new guidelines for, among other things, determining the metric of quality [15]. Certainly, such measurements are important when determining which health resource to refer (though in this case, the health resource is limited to practicing groups that are currently enrolled in the pilot program). Since many P4P concepts are inherently qualitative, and therefore vague, it is viable to employ fuzzy principles to interpret P4P values. For example, one measurement of quality is "timely access to care", for which there are no definite guidelines. According to Williams, three categories of metrics are defined that can help gauge the quality of a particular practice

1. P4P Clinical Measures which measures (mostly) quantitative metrics about health issues like proper screening of individuals for health problems
2. P4P Patient Experience Measures which measures (mostly) qualitative patient experience metrics such as level of communication and care coordination
3. P4P Information Technology Investment Measures which measures (mostly) qualitative metrics about how well information technology is employed to help improve efficiency and reduce costs and errors

Clearly P4P Patient Experience Measures and P4P Information Technology Measures are areas in which fuzzy principles can be employed to determine the overall quality of a particular practice for referral.

3 SYSTEM DESIGN

3.1 Application Stack

The H2R2E is an integral part of a web application, dubbed Hygeia, built primarily on an open-source Java / MySQL stack. Our application is an ensemble of modules addressing different aspects of health including monitoring, diagnostic, and referral.

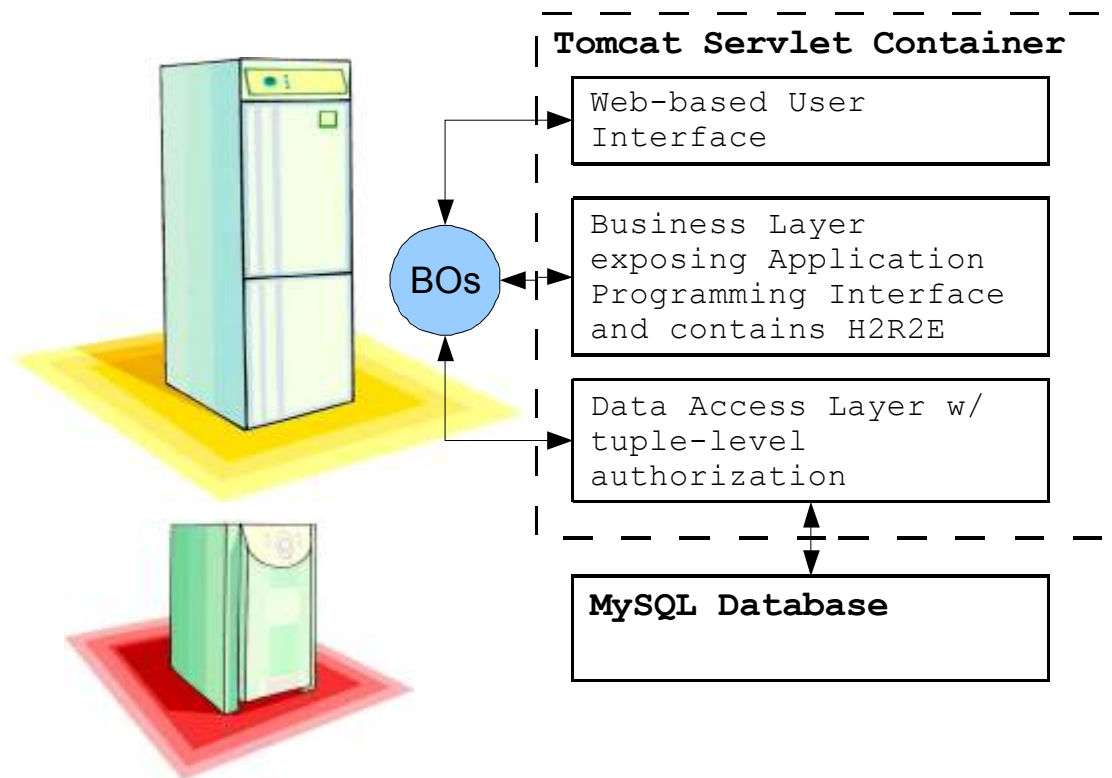


Figure 1 - Hygeia application stack

The major functional components of the Hygeia are:

1. A web-based User-Interface (UI) layer built with the Echo 2 Framework. It is also responsible for populating the Java HTTP Session with the user information upon a successful authentication event.
2. A business layer that encapsulates the majority of all domain-specific logic as Plain Old Java Objects (POJOs). It is Hygeia's Application Programming Interface (API) that serves the UI layer and can serve a web-service layer. It relies on the Spring Framework for transaction

demarcation and autowiring for dependency injection. It also abstracts access to H2R2E.

3. The data access layer is a collection of Data Access Objects (DAOs) that abstracts access to an underlying data source (in this case, the MySQL database). Hibernate is employed for Object-to-Relational Mapping (ORM) functionalities.
4. The business objects (BO's) are simple entities that map to database relations. They are used to transport data along the various layers. Both the Java Persistence API and Hibernate Entity API are employed to annotate the Java entities. To ensure privacy of user information, tuple-level authorization is enforced when appropriate.
5. The security aspect of Hygeia is encapsulated as a user object maintained within an ACEGI security context. This information is populated in the UI, maintained by the Tomcat Servlet Container, and access primarily by the DAOs for authorization.
6. Auditing is implemented as part of the logging aspect of Hygeia. Business layer operations properly annotated are automatically logged.
7. MySQL provides the underlying data source. Though Hibernate enables us to swap out different database engines, we choose MySQL for its ease of deployment, large documentation base, open-source nature, and maturity.

3.2 Input Variables

There are two (2) types of input variables in our system: 1) explicit variables like date of birth or sex and 2) fuzzy variables like alcohol dependence. Most fuzzy variables have an associated explicit input (i.e. the Body Mass Index has a quantitative value as well as an associated qualitative fuzzy linguistic variable).

Name	Description	Fuzzy Outputs
Body Mass Index (BMI) [16]	Body Mass Index calculated with $(\text{weight} / (\text{height} * \text{height})) * 703.0$	Underweight, Ideal, Overweight, Obese
Language	Whether or not the user can speak, read, or write in the language and what is the primary language	N/A
Date of Birth		N/A
Income [17]	Approximate income as a percentage of the Area Median Income (AMI). We added additional categories as needed.	Very Low, Low, Moderate, Above Moderate, Wealthy, Very Wealthy
Sex		N/A
Primary Residence	Zip code used to determine nearest health resources	N/A

Alcohol Consumption [18]		Light, Medium, Heavy
Empirically-Based Alcohol Dependence Scale (EBADS) [19]	Revised Alcohol Dependence Scale (ADS) based on correlation between answer and actual dependence	Low Risk, Moderate Risk, High Risk, Very High Risk
Exercise Amount [20]		Minimal, Medium, Much
Cigarette Dependence Scale (CDS) 12 Risk Variable [21]	As 12-question form to determine the risk of cigarette dependence	Low Risk, Moderate Risk, High Risk, Very High Risk
Binge Drinking Variable [22]		No Risk, Moderate Risk, High Risk, Very High Risk

Table 3 - Input variables

We make best-effort to ensure that the fuzzy variables we use are valid. However, not all information is available at the granularity that we desire. For instance, information for California income does not suffice because of the great disparities among the various counties. Ergo, we opted to use fuzzy income variables for San Diego.

At the time of this writing, we did not have time to fully employ the BMI fuzzy variable or the exercise amount fuzzy variable, so it is not useful for us to describe their membership functions. The income's, alcohol consumption's, and binge drinking's fuzzy membership functions are defined below:

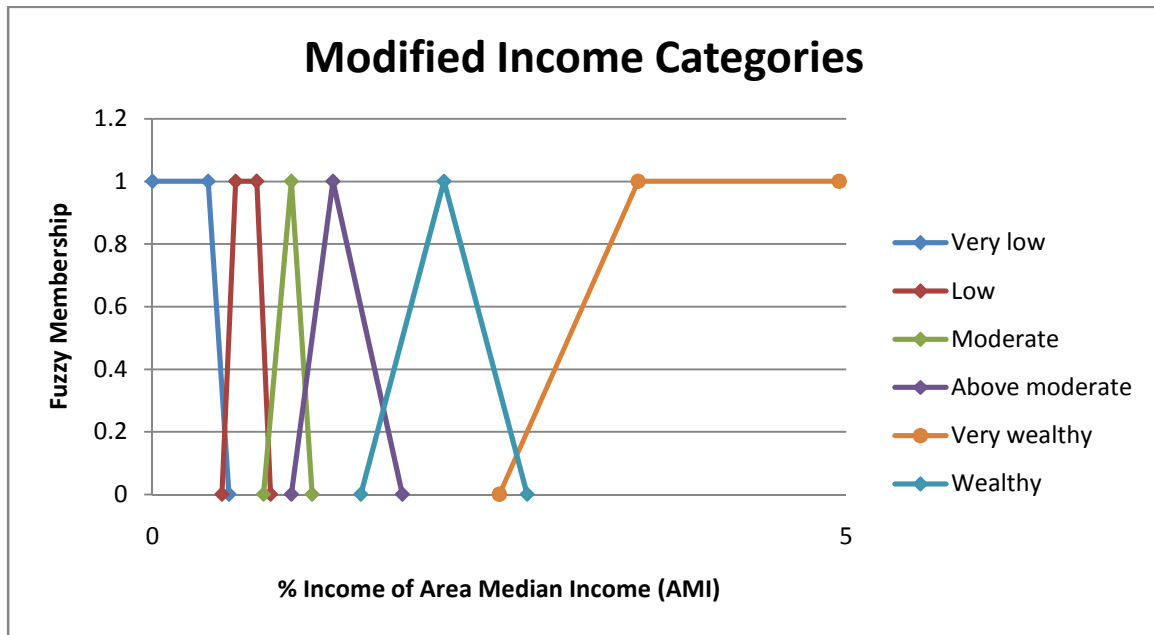


Figure 2 - Fuzzy membership for income

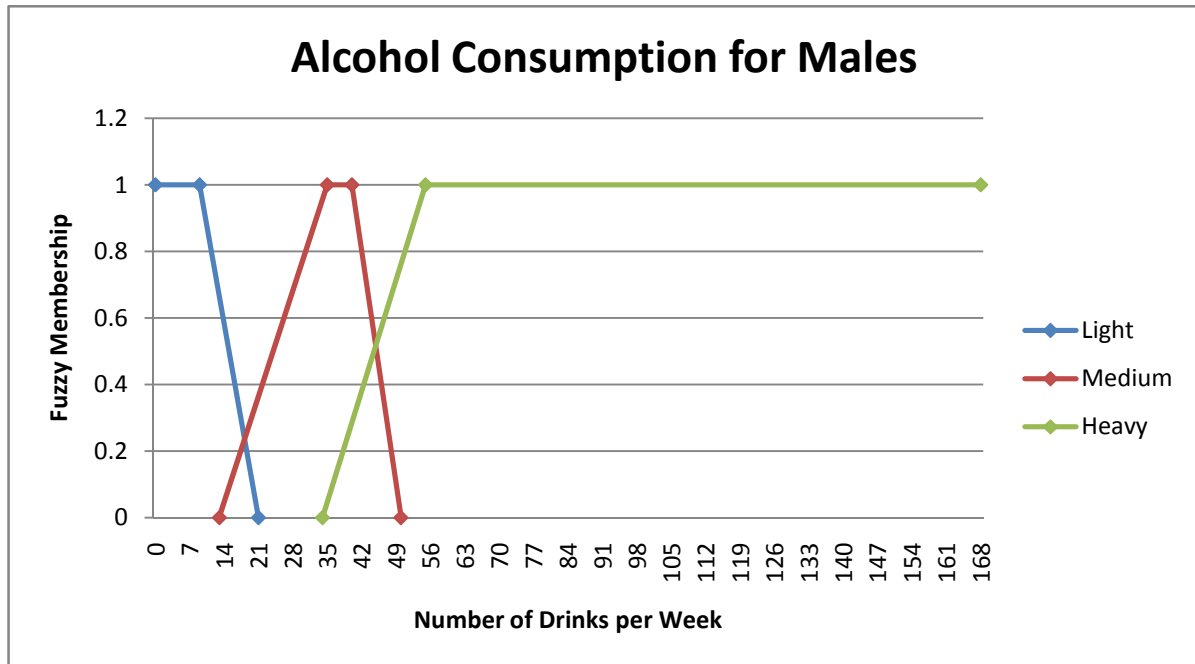


Figure 3 - Fuzzy membership for alcohol consumption for males

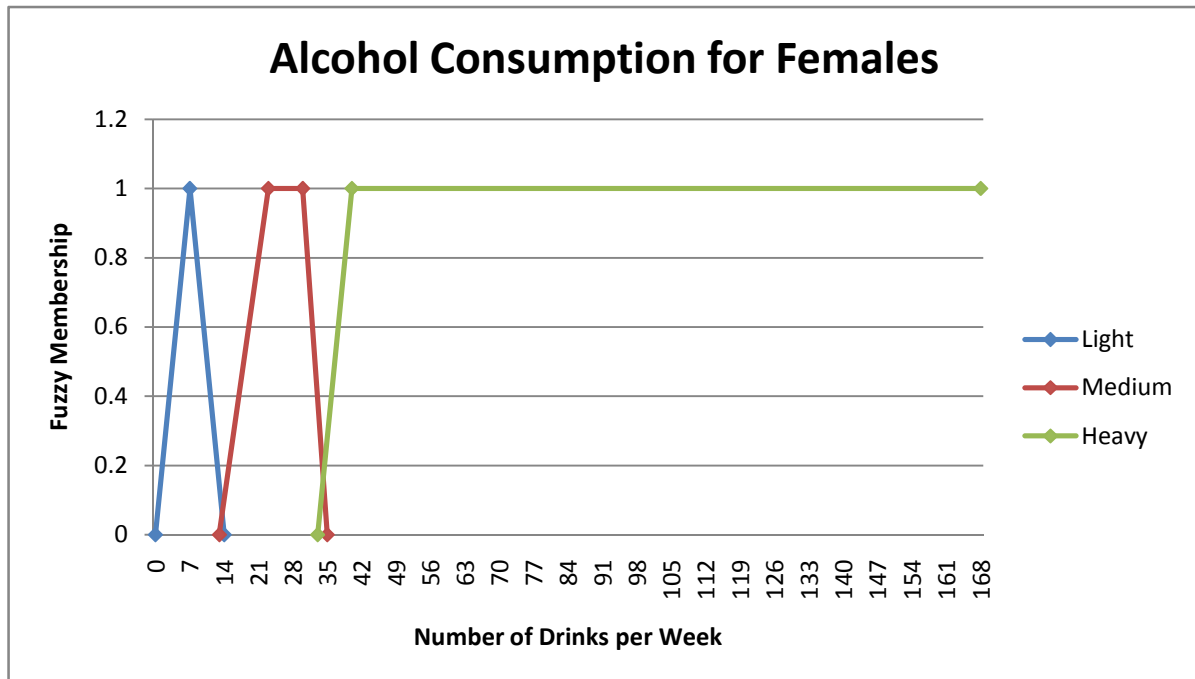


Figure 4 - Fuzzy membership for alcohol consumption for females



Figure 5 - Fuzzy membership for binge drinking risk

3.3 Rules

H2R2E is, at its core, a rule engine. Akin to its variables counterpart, the H2R2E rules are divided into 1) explicit like distance in miles and 2) fuzzy like alcohol suggested care.

Suggested care variables are based on the various risk variables. We first divide the risk variables into either alcohol-related or cigarette-related. We then feed the risk variables into our engine with forwards the variables into either the alcohol suggested care ruleset or the cigarette dependence ruleset to derive the most appropriate suggested care variable for alcohol and cigarette dependency treatment.

Input	Suggested Care
Alcohol consumption is heavy	Out patient or intensive out patient
Binge drinking is high risk	Out patient
Binge drinking is moderate risk and alcohol consumption is medium	Brief counseling
Alcohol consumption is heavy and binge drinking is very high risk	Physical intensive in patient
EBADS is moderate risk and binge drinking is moderate risk	Out patient
Binge drinking is moderate risk or no risk and alcohol consumption is light	Advice
EBADS is low risk	Advice
EBADS is high risk or very high risk	Physical intensive in patient
EBADS is moderate risk	Out patient
Binge drinking is very high risk	Out patient

Alcohol consumption is light	Advice
Alcohol consumption is medium	Brief counseling
Binge drinking is moderate risk and alcohol consumption is light	Brief counseling
Binge drinking is no risk	Advice
CDS is low risk	Advice
CDS is moderate risk	Brief counseling
CDS is high risk or very high risk	Out patient

Table 4 - H2R2E Rules

These suggested care variables are useful themselves, but we also employ them to find the appropriate health resources. One aim of H2R2E is to generate the level of suggested care that is most relevant to the user based on the user profile so that user is unburdened from having to understand domain-specific information.

3.4 Health Resources

We have collected a list of health resources that we suggest to the user based on their profile. Specifically, we associated any number of suggested care variables with a particular health resource. Based on these suggested care variables, fuzzy income linguistic values, and non-fuzzy data like location and sex-specific services, we derive the list of health resources that is most appropriate for the user. One aim of H2R2E is to produce a list of health resources that is most relevant to the user based on several factors including location, cost, and suggested care.

name,description,streetAddress1,streetAddress2,zipCode1,zipCode2,city,areaCode,mainNumber,website,associatedSuggestCare,classification,sexSpecificService,emailAddress

Amicus House,"Amicus House, located in San Jose, California, is an organization that has been dedicated to helping those with drug and alcohol abuse problems since 1989. Working towards a common goal, our highly qualified staff provides guidance, care and treatment in an intensive and caring environment.",466 South Buena Vista Avenue,,95126,,San

Jose,408,2942277,www.amicushouse.com,IN_PATIENT,COMMERCIAL,,info@amicushouse.com,ALCOHOL

Stanford Prevention Research Center,This program is a part of a smoking cessation study conducted by the Stanford Prevention Research Center (SPRC) at Stanford University Medical School. ,2674 North 1st Street,Suite 112,95134,,San

Jose,866,2187848,stopsmoking.stanford.edu,BRIEF_COUNSELING,FREE,,CIGARETTE

Figure 6 - Sample health resources

3.5 Discussion of Questionnaires

There are two (2) major questionnaires employed by our application. Because we focused primarily on alcohol and cigarette dependence, we choose one (1) questionnaire for each topic.

The empirically-based Alcohol Dependence Scale (ADS) [19] was preferred in lieu of the [23] because Kahler *et al.* demonstrated the lack of correlation between how the patient answered the question and the patient's level of dependency. That is, users who are more susceptible to being dependent on alcohol should choose answers that are different than those who are materially less dependent on alcohol. Questions from the original ADS that did not reflect this are removed. Answers where there is no distinguishable difference between the groups are collapsed when scored. Because our system relies substantially on the user's answers, it is of paramount importance that we choose a scaling system with a high correlation between the answer and the actual level of dependency. We maintained the scoring scheme proposed by Kahler *et al.* and implemented the following membership functions:

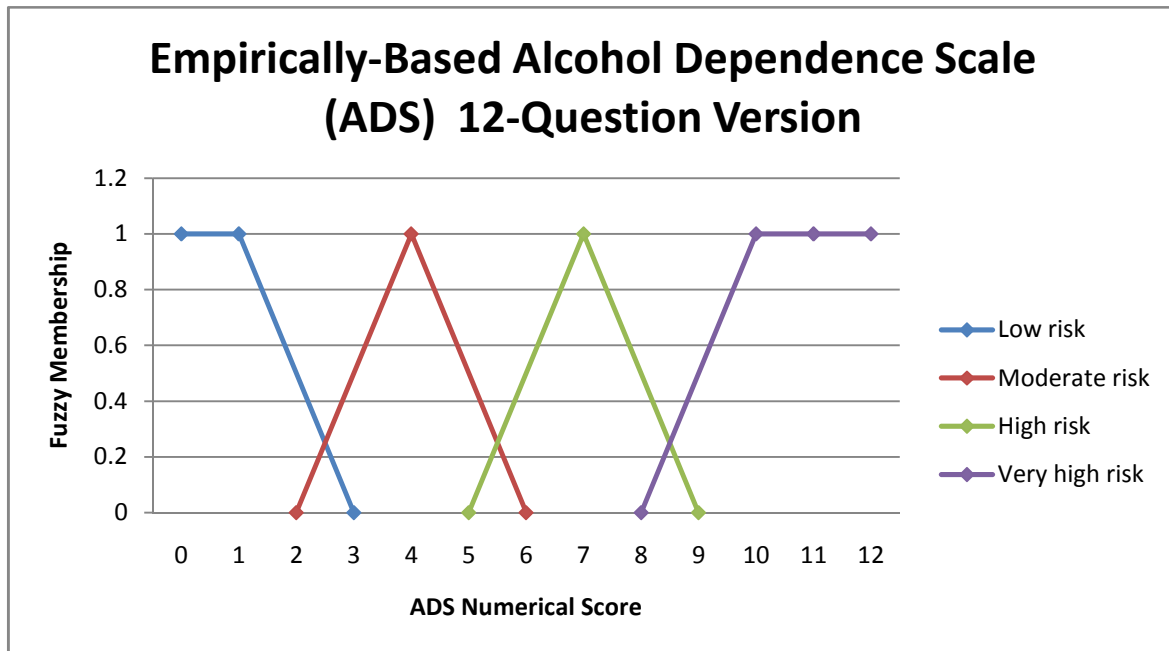


Figure 7 - Fuzzy membership for empirically-based Alcohol Dependence Scale (ADS)

The Cigarette Dependence Scale (CDS) is a 12-question scale with answers that are both quantitative and qualitative. The Cronbach's alpha coefficient is a measurement of correlation between items. This statistic increases as the sample size increases or the inter-item correlation increases. We employed the CDS-12 questionnaire because Etter concluded that among internet users, the CDS-12 had a higher Cronbach's alpha coefficient than the the CDS-5 version, Fagerström test for nicotine dependence (FTND), and the heaviness of smoking index (HSI) [21]. We maintained the scoring scheme proposed by Etter implemented the following membership functions:

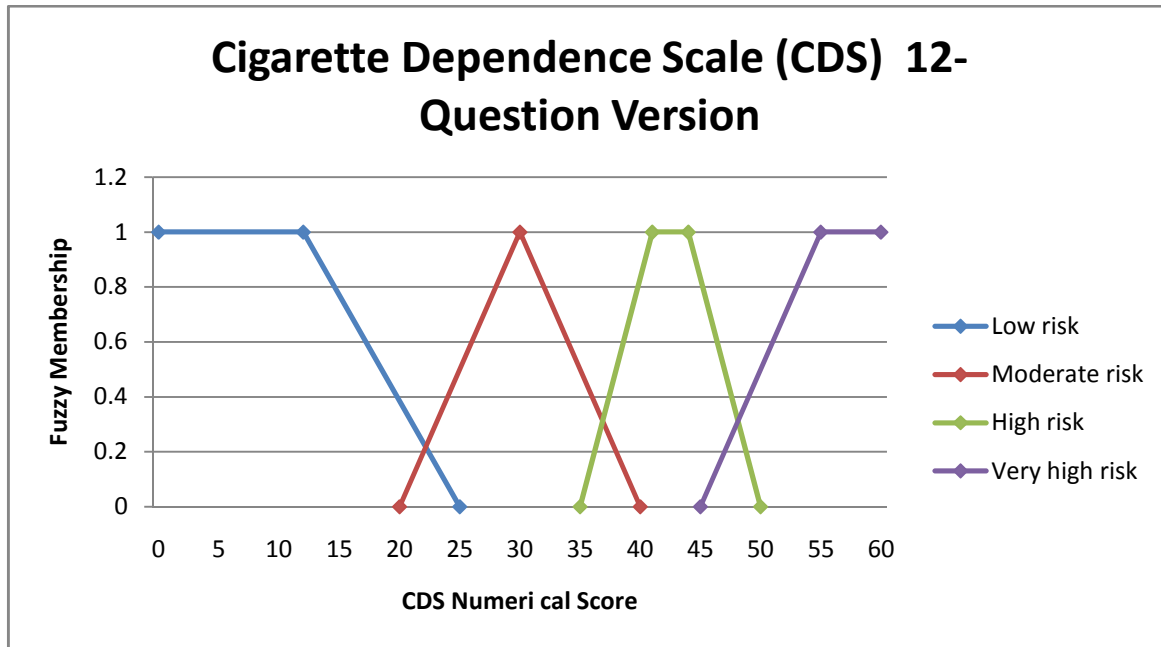


Figure 8 - Fuzzy membership for Cigarette Dependence Scale (CDS)

3.6 Modules and API

Hygeia is as much a Business-to-Business (B2B) API as it is an end-user web application. In accordance with lessons learned in designing the NetBeans infrastructure, we have labored to create a service API that makes Hygeia as modularized as possible so that components can be reused [24]. We have gone to great lengths to incorporate numerous best-practices for API design [25] to ensure that our API

1. is domain-relevant by providing context-relevant operations on our application
2. is minimal yet functional by providing simple operations that can be grouped together to perform complex operations
3. is consistent with the help of factories, interfaces, and attention to conventions
4. avoids leaking implementation details by providing domain-specific data transfer objects (DTOs) and hiding or wrapping exceptions when appropriate

The Software as a Service (SaaS) paradigm is something that we inspire Hygeia to be. It proposes the development of applications as a service for users (which can be humans or other applications) by providing access through the internet. This paradigm would unburden users from having to maintain local installations

and applications will be defined in terms of what functionalities or services they provide [26]. By building a web-service interface, any application can adhere to this paradigm. With relative ease, a web-service layer can be built on top of our existing business layer.

By building our application as an ensemble of modules, future systems may build upon our API. These modules were assembled over a protracted period of time, during which the focus of our study shifted along with new understanding of the domain and application structure. Ergo, it is important to note that we originally started this project as Hygeia with Hygeia modules and then subsequently named the H2R2E component. The inconsistency in package name reflects this change. This partial list contains only modules relevant to the project, as opposed to “dead” code that we initially wrote, but abandoned as we focused more on the core components of the project.

Module	Description	Root Java Package Name
h2r2e-bo	Business objects for H2R2E module	edu.sjsu.cs.duybaovo.h2r2e.bo
h2r2e-business	Business layer for H2R2E module including fuzzy variables, rule engine, and API	edu.sjsu.cs.duybaovo.h2r2e.business
h2r2e-model	Data access layer for H2R2E module	edu.sjsu.cs.duybaovo.h2r2e.model
h2r2e-webui	Web UI components for H2R2E module	edu.sjsu.cs.duybaovo.h2r2e.webui
hygeia-aspect	Cross-concern aspects for the entire application like annotation-based logging	hygeia.aspect.logging
hygeia-bo-account	Business objects for account information module	hygeia.bo.account
hygeia-bo-common	Common business objects employed throughout the application	hygeia.bo.common
hygeia-bo-information	Business objects for various information about a user	hygeia.bo.information
hygeia-bo-pchr	Business objects for the personally-controlled health records (PCHR) information module	hygeia.bo.pchr
hygeia-business-account	Business layer for account information	hygeia.business.account
hygeia-business-common	Common business layer components employed throughout the code	hygeia.business.common
hygeia-business-information	Business layer for user information	hygeia.business.information
hygeia-business-organization	Business layer for organizational information	hygeia.business.organization
hygeia-business-pchr	Business layer for PCHR information	hygeia.business.pchr
hygeia-common-util	Utility classes employed throughout the entire application	hygeia.common.util

Heuristic Health Resource Referral (H2R2) Engine

hygeia-model-account	Data access layer for account information	hygeia.model.account
hygeia-model-common	Common data access components	hygeia.model.common
hygeia-model-information	Data access layer for user information	hygeia.model.information
hygeia-model-pchr	Data access layer for PCHR information	hygeia.model.pchr
hygeia-test	Test utilities for the application. Individual test relevant to each module are contained within the modules	hygeia.test
hygeia-webui	The module that builds the entire application and packages it along with context-relevant information	hygeia.webui
hygeia-webui-account	Web UI components for account information	hygeia.webui.account
hygeia-webui-common	Common UI components employed throughout the application	hygeia.webui.common
hygeia-webui-dmz	Unsecured Web UI components like login page	hygeia.webui.dmz
hygeia-webui-information	Web UI components for user information	hygeia.webui.information
hygeia-webui-pchr	Web UI components for PCHR information	hygeia.webui.pchr

Table 5 - Modules and Packages

4 IMPLEMENTATION

4.1 Interfaces

To 1) create a standardized code base and 2) reduce duplicate code, we make extensive use of interfaces (note that we refer to interfaces in the general sense which includes Java abstract classes and not strictly Java interfaces). The following table documents major interfaces employed throughout the application.

Interface	Description
hygeia.bo.common.DatabaseEntity	Mapped entity to all database relations without authorization information
hygeia.bo.information.AccessControlledDatabaseEntity	Subclass of DatabaseEntity specifying that there is an authorization component provided through hygeia.bo.common.security.AccessControlData
hygeia.bo.common.BusinessObject	Parent JavaBeans for all data objects
hygeia.model.common.dao.AbstractDao	Parent DAO containing transaction session information and basic Create Retrieve Update Delete (CRUD) operations
hygeia.business.common.operation.AbstractHygeiaOperation	Abstract business layer POJO implementing HygeiaOperation
hygeia.business.common.operation.HygeiaOperation	Java interface type implemented by AbstractHygeiaOperation for creating proxies

Table 6 - Major application interfaces

4.2 Web UI

Because our application has a web-based user interface (UI), it is important to determine its usability from a user standpoint. Lathan *et al.* studied NASA's Spacebridge to Russia web application and determined its overall usability by employing the heuristic approach to UI evaluation [27]. Based on the Human Computer Interface (HCI) Evaluation techniques developed by the group, the following 10 metrics are noted and are applied to H2R2E's web-based UI as time permits:

UI Design Principle	Implementation
Visibility of system status and function	Our system is divided into different views for different types of users. For instance, a user with the role of a developer will see a different screen than one with a role of an individual.

Speak the user's language	Our application is language-agnostic; it supports internationalization (I18N) approaches. This is an important component to a web application that aims to serve traditionally underserved populations. We make extensive use of Java resource bundles.
User-control and freedom	Our application will employ Asynchronous JavaScript and XML (AJAX) technologies to allow for saving of information and multiple view windows to be displayed without losing information.
Consistency and standards	We use the Factory and Inheritance design patterns to ensure that UI components are standardized.
Error prevention	Our application uses the Hibernate Validator library to ensure fail-fast validation for user interactions.
Recognition rather than recall	We use AJAX-backed tabs and panes to display information.
Flexible and efficient access	With AJAX, we can load information quickly.
Aesthetic and minimalist design	With a role-relevant approach towards UI development, users will only see information that is relevant to their tasks.
Useful error messages	With I18N support, we can display user errors in the user's preferred language.
Help for and documentation of new information	We maintain a simple user guide.

Table 7 - User Interface Implementation

4.3 Transaction Demarcation

The concepts of Atomicity, Consistency, Isolation, and Durability (ACID) collectively define properties needed for a reliable execution of database transactions. As application developers, we generally do not concern ourselves too much with atomicity, consistency, and durability because the underlying database management system (DBMS) usually handles them for us. For isolation, we rely on the Spring Framework's transaction demarcation. With this framework, we can define boundaries for when to commit or rollback a transaction and whether or not to propagate a single transaction among multiple API calls so that either all transactions successfully commit, or none at all, ensuring that our data within the database remains valid. This is especially useful because a complex operation might require multiple smaller operations (i.e. to add a new weight measurement, we must create a weight trend, if one does not exist, and create a PCHR information holder, if one does not exist, and bind it to the appropriate user account, which would require five (5) separate API calls).

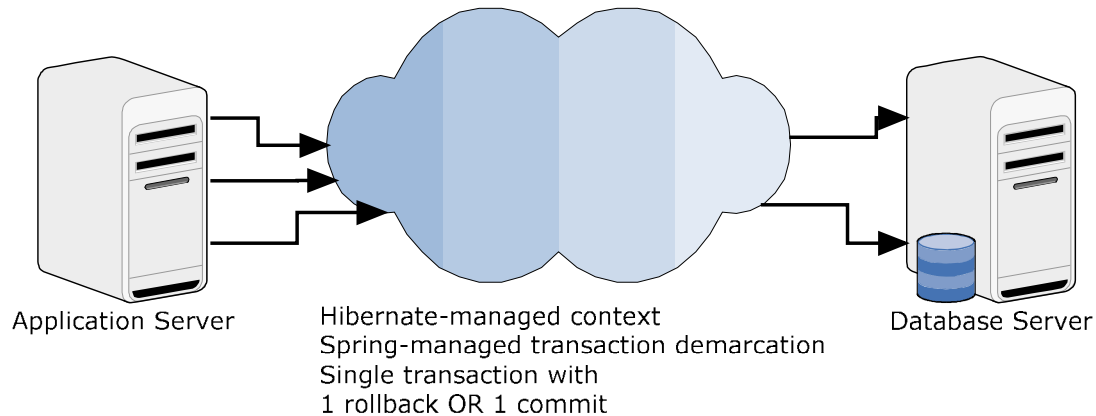


Figure 9 - Transaction Demarcation

4.4 Persistence Context

A persistence context is set of database entity objects for which there is a unique entity mapped to a unique persistent identity and is managed by an entity manager. The Hibernate Framework is a superb ORM and persistent context provider. It also automatically handles entity caching, connection pooling, and free-text search by coupling with the Lucene API. By leveraging Hibernate, we are unburdened from many “database plumbing code.”

4.5 Security Context

Both concepts of authentication and authorization are first-class concerns for our application. This ensures that our application safeguards our user’s information.

Authentication is achieved with a one-way, salted password hash with the SHA-256 algorithm (which no successful attacks have been achieved against this algorithm [28]). The Java Security API handles the authentication of the user and then the authenticated principal object (our user) is bind to a Java HTTP session maintained by the Servlet container. We subsequently retrieve and store the authenticated principal object in ACEGI’s *SecurityContext*.

For our application, authorization is a tuple-level concern; for any database entity requiring authorization before access, there is a mapping to a collection of *hygeia.bo.common.security.AccessControlData* objects (which maps to its own table for each entity). For example, *hygeia.bo.information.IdentityInformation* has its own set of *hygeia.bo.common.security.AccessControlData* objects as prescribed by the *hygeia.bo.common.security.AccessControlledDatabaseEntity* parent class.

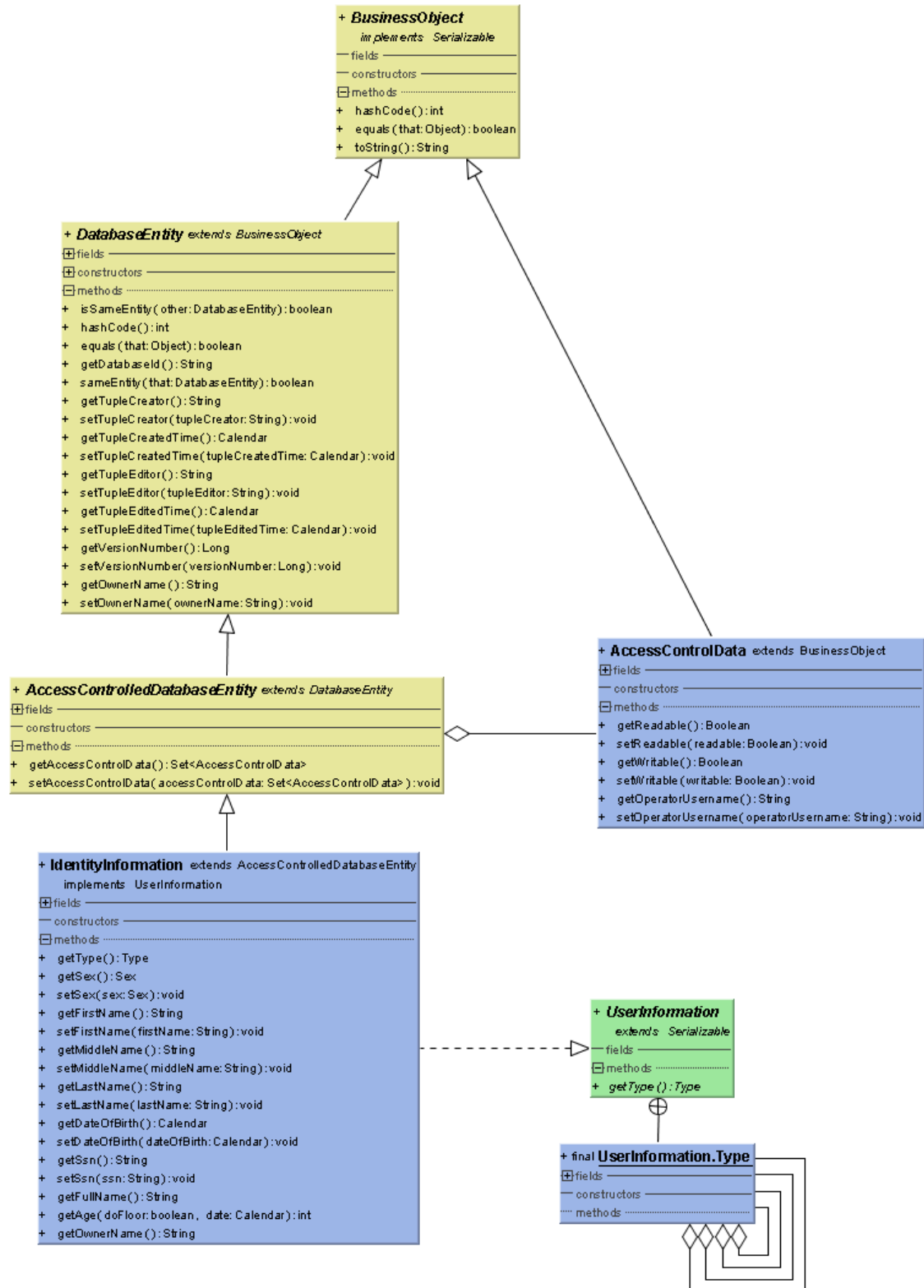


Figure 10 - Authorization through AccessControlledDatabaseEntity

Thanks to Hibernate, the corresponding tables are created in the database. The analogous example, when examined from the database, shows that the *identityinformation* table has corresponding authorization-relevant entries in the *identityinformation_accesscontroldata* (as evident by the same primary keys in both tables). By querying for the authorization information from the tables, we can derive who is authorized for what kind of access to the respective tuples.

databaseId	owner Name	tupleCreatedTime	tupleCreator	tupleEditTime	tupleEditor	versionNumber	dateOfBirth	firstName	lastName	middleName
ec34fc47-81fc-11dd-8e6e-001558869786	admin	2008-09-13 18:31:58.0	admin	2008-09-13 18:31:58.0	admin	0	1374-11-27 05:45:17.0	Admin	User	<null>
ec3e9951-81fc-11dd-8e6e-001558869786	qa	2008-09-13 18:31:58.0	admin	2008-09-13 18:31:58.0	admin	0	1985-11-08 18:31:58.0	Chan Chan	Tran	Thi

IdentityInformation_databaseId	operatorUsername
ec34fc47-81fc-11dd-8e6e-001558869786	admin
ec3e9951-81fc-11dd-8e6e-001558869786	qa

Table 8 - Sample tuples for authorization of identity information

4.6 Logging and Auditing

In many secured web applications, it is not sufficient to provide authentication and authorization mechanisms; often, it is desirable to provide auditing trails for non-repudiation. Because PCHR information is very private, it is not only important to control access to the information, but note who accessed the information when, even if that user or system has permission to access the information. This trail invaluable if for diagnosing user error as it relates to privacy access.

To a less important security, but much more important pragmatic point, having proper logging can be crucial to diagnosing system errors. Many times, by looking at an error stack trace or follow a trail of statements with debug logging, we can pinpoint the source of the error with impeccable precision. Proper logging can also be helpful in diagnosing potential problems like performance bottlenecks and understand which components of our system provide the greatest utility.

Hygeia logging is implemented with the *Log4J* library. We have also constructed our own annotation-based logging utility with suggestions from Noheda [29] using Spring's Aspect-Oriented Programming (AOP) libraries and the Java Reflection API. By default, the logger captures the inputs and outputs of the various API calls with a simple annotation.

Simply annotating a method with the `@BusinessAuditLog` will result in the following calls 1) when entering the method and 2) when returning from the method.

`@BusinessAuditLog`

public E getUniqueForUser(final User owner);

```
21:29:11,140 INFO AbstractHygeiaOperation:32 - CALLING public hygeia.bo.common.DatabaseEntity
hygeia.business.common.operation.AbstractHygeiaOperation.getUniqueForUser(hygeia.bo.account.User)PARAMETER:hygeia.bo.account.User@1debf3[permissions=<null>,preferenc
es=hygeia.bo.information.Preferences@1c37b8f[languageProficiencies=[hygeia.bo.information.LanguageProficiency@1f6c439[canRead=true,isPrimary=<null>,canWrite=true,supporte
dIso639Key=en,canSpeak=true,tupleEditor=qa,ownerName=qa,databaseId=9bd168f4-8792-11dd-a0f8-001b770639be],
hygeia.bo.information.LanguageProficiency@1cc7f4b[canRead=true,isPrimary=true,canWrite=<null>,supportedIso639Key=vi,canSpeak=true,tupleEditor=qa,ownerName=qa,database
Id=9bd168f4-8792-11dd-a0f8-001b770639be],
hygeia.bo.information.LanguageProficiency@f92cc8[canRead=<null>,isPrimary=<null>,canWrite=<null>,supportedIso639Key=ko,canSpeak=<null>,tupleEditor=qa,ownerName=qa,da
atabaseId=757abb62-8794-11dd-a0f8-001b770639be],
hygeia.bo.information.LanguageProficiency@b92956[canRead=true,isPrimary=<null>,canWrite=<null>,supportedIso639Key=es,canSpeak=<null>,tupleEditor=qa,ownerName=qa,da
atabaseId=9bd168f4-8792-11dd-a0f8-001b770639be],
hygeia.bo.information.LanguageProficiency@1bf9980[canRead=<null>,isPrimary=<null>,canWrite=<null>,supportedIso639Key=zh,canSpeak=<null>,tupleEditor=qa,ownerName=
qa,databaseId=757abb63-8794-11dd-a0f8-001b770639be]],tupleEditor=qa,ownerName=qa,databaseId=9bd168f4-8792-11dd-a0f8-
001b770639be],identityInformation=hygeia.bo.information.IdentityInformation@152d950[ssn=123521234,firstName=Chan
Chan,sex=FEMALE,dateOfBirth=java.util.GregorianCalendar[time=500360764000,areFieldsSet=true,areAllFieldsSet=true,lenient=true,zone=sun.util.calendar.ZoneInfo[id="America/
Los_Angeles",offset=-28800000,dstSavings=3600000,useDaylight=true,transitions=185,lastRule=java.util.SimpleTimeZone[id=America/Los_Angeles,offset=-
28800000,dstSavings=3600000,useDaylight=true,startYear=0,startMode=3,startMonth=2,startDay=8,startDayOfWeek=1,startTime=7200000,startTimeMode=0,endMode=3,endMonth
=10,endDay=1,endDayOfWeek=1,endTime=7200000,endTimeMode=0]],firstDayOfWeek=1,minimalDaysInFirstWeek=1,ERA=1,YEAR=1985,MONTH=10,WEEK_OF_YEAR=45
,WEEK_OF_MONTH=2,DAY_OF_MONTH=8,DAY_OF_YEAR=312,DAY_OF_WEEK=6,DAY_OF_WEEK_IN_MONTH=2,AM_PM=1,HOUR=9,HOUR_OF_DAY=21,M
INUTE=6,SECOND=4,MILLISECOND=0,ZONE_OFFSET=-
28800000,DST_OFFSET=0],middleName=Thi,lastName=Tran,accessControlData=[hygeia.bo.common.security.AccessControlData@ce82cc[readable=true,writable=true,operatorUser
name=qa]],tupleEditor=admin,ownerName=qa,databaseId=9bd16904-8792-11dd-a0f8-
001b770639be],username=qa,contactInformation=hygeia.bo.information.contact.ContactInformation@152e7a4[addresses=[hygeia.bo.information.contact.Address@f8f332[city=San
Jose,zipCode2=<null>,type=HOME,state=CA,zipCode1=95138,streetAddress2=<null>,streetAddress1=5552 Sunspring
Circle,isPrimary=true,tupleEditor=admin,ownerName=qa,databaseId=9bd168f4-8792-11dd-a0f8-001b770639be], hygeia.bo.information.contact.Address@8bf135[city=Santa
Clara,zipCode2=<null>,type=WORK,state=CA,zipCode1=54321,streetAddress2=<null>,streetAddress1=321 Some Other
Street,isPrimary=<null>,tupleEditor=admin,ownerName=qa,databaseId=9bd168f5-8792-11dd-a0f8-
001b770639be]],emailAddresses=[hygeia.bo.information.contact.EmailAddress@267f18[isPrimary=true,address=success@hygeia.com,tupleEditor=admin,ownerName=qa,databaseId=9
bd168f2-8792-11dd-a0f8-001b770639be], hygeia.bo.information.contact.EmailAddress@19d277e[isPrimary=<null>,address=carpe-
diem@goodchh.com,tupleEditor=admin,ownerName=qa,databaseId=9bd168f3-8792-11dd-a0f8-
001b770639be]],phoneNumbers=[hygeia.bo.information.contact.PhoneNumber@1e5ebbff[areaCode=408,isPrimary=<null>,type=HOME,mainNumber=1237890,tupleEditor=admin,o
wnerName=qa,databaseId=9bd168f7-8792-11dd-a0f8-001b770639be],
hygeia.bo.information.contact.PhoneNumber@1d8643c[areaCode=415,isPrimary=<null>,type=OFFICE,mainNumber=1231234,tupleEditor=admin,ownerName=qa,databaseId=9bd1
68f8-8792-11dd-a0f8-001b770639be],
hygeia.bo.information.contact.PhoneNumber@1623820[areaCode=408,isPrimary=true,type=MOBILE,mainNumber=1234567,tupleEditor=admin,ownerName=qa,databaseId=9bd168
f6-8792-11dd-a0f8-001b770639be]],tupleEditor=admin,ownerName=qa,databaseId=9bd168f1-8792-11dd-a0f8-001b770639be],tupleEditor=qa,ownerName=qa,databaseId=9bd168ef-
8792-11dd-a0f8-001b770639be]
```

```
21:29:11,343 INFO AbstractHygeiaOperation:44 - EXITING public hygeia.bo.common.DatabaseEntity
hygeia.business.common.operation.AbstractHygeiaOperation.getUniqueForUser(hygeia.bo.account.User) WITH
hygeia.bo.information.IdentityInformation@68bcef[ssn=123521234,firstName=Chan
Chan,sex=FEMALE,dateOfBirth=java.util.GregorianCalendar[time=500360764000,areFieldsSet=true,areAllFieldsSet=true,lenient=true,zone=sun.util.calendar.ZoneInfo[id="America/
Los_Angeles",offset=-28800000,dstSavings=3600000,useDaylight=true,transitions=185,lastRule=java.util.SimpleTimeZone[id=America/Los_Angeles,offset=-
28800000,dstSavings=3600000,useDaylight=true,startYear=0,startMode=3,startMonth=2,startDay=8,startDayOfWeek=1,startTime=7200000,startTimeMode=0,endMode=3,endMonth
=10,endDay=1,endDayOfWeek=1,endTime=7200000,endTimeMode=0]],firstDayOfWeek=1,minimalDaysInFirstWeek=1,ERA=1,YEAR=1985,MONTH=10,WEEK_OF_YEAR=45
,WEEK_OF_MONTH=2,DAY_OF_MONTH=8,DAY_OF_YEAR=312,DAY_OF_WEEK=6,DAY_OF_WEEK_IN_MONTH=2,AM_PM=1,HOUR=9,HOUR_OF_DAY=21,M
INUTE=6,SECOND=4,MILLISECOND=0,ZONE_OFFSET=-
28800000,DST_OFFSET=0],middleName=Thi,lastName=Tran,accessControlData=[hygeia.bo.common.security.AccessControlData@17b5179[readable=true,writable=true,operatorUs
ername=qa]],tupleEditor=admin,ownerName=qa,databaseId=9bd16904-8792-11dd-a0f8-001b770639be]
```

Figure 11 - Sample logging information

The exact fields that are displayed in the logging message 1) are annotated with the `@NonStringContributor` and 2) the `toString()` method does not throw an exception (which usually happens for proxies).

5 EXPERIMENTAL RESULTS

5.1 Methodology

We do not anticipate our test participants to be heavily dependent on alcohol or cigarette. Hence, we anticipate that should our users enter information about themselves, the results will not be very valuable. Thus, we have elected to create two (2) fictitious characters with varying levels of addiction to alcoholism and cigarette. The experiment was sanctioned by SJSU's Institutional Review Board (see Appendix). Furthermore, we have attributed income and location information to each character.

John Doe was born in 1951 and lives at 1036 South 5th Street, San Jose, CA 95192. John earns about \$35,000 per year. He has been drinking heavily since he was 20. He drinks throughout the day and consumes about 70 drinks per week and binges about 7 days a week. He occasionally passes out and when sobering up, he experiences "the shakes" and a rapid heartbeat. He is often afraid of not having a drink handy, so he keeps a bottle of liquor nearby. He frequently experiences hour-long blackouts. John also smokes 3 – 5 cigarettes a day and finds it fairly difficult to quit. Usually within 60 minutes of waking up, he has a noticeable urge to smoke. He can function on days without cigarette, but does carry around a pack to help combat the urge.

Jane Doe was born in 1983 and lives at 1636 W. Campbell Avenue, Campbell, CA 95008. She earns \$75,000 per year. She has been smoking off and on since she was 17. She doesn't smoke every day, and, when she does, she smokes later in the day (several hours after waking up). She smokes fewer than 5 cigarettes a day. She does not feel that she is "addicted" to cigarettes because she doesn't ever feel the urge to smoke. She doesn't buy cigarettes that often, and she has experienced no health problems from smoking. Nevertheless, she would like to quit. She doesn't think it would be too difficult to quit, but she would like to get some help. Jane also has a one or two drinks a day. Jane doesn't feel that she needs to drink, but, on weekly festive occasions she does pass out from binge drinking.

Figure 12 – Description of fictitious characters

Two groups were employed for this test. Of the seventy-four (74) subjects, thirty-six (36) subjects filled out information about the fictitious characters via H2R2E and thirty-eight (38) subjects used whatever search engines they deem appropriate to search for health resources and attempt to identify the level of care appropriate for the fictitious characters. Additional instructions are provided to the subjects in Appendix D. The test subjects were randomly placed into the groups and selected from a group of university students.

5.2 Data

The following data was compiled from the subjects. Scores were assigned to the selection of suggested care and resource for each of the 2 fictitious characters. G 1 is the H2R2E group and G 2 is the Search group.

Heuristic Health Resource Referral (H2R2) Engine

U	G	ASC	ASC Sc	AR	AR Sc	OA Sc	CSC	CSC Sc	CR	CR Sc	OC Sc	T
Jane-10-EO	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	19
Jane-11-IE	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	25
Jane-12-PQ	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	22
Jane-13-TO	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	ADVICE	5	Last Stop Smoking	1	6	14
Jane-14-JR	1	OUT_PATIENT	3	alcoholism.about.com/od/tx_ca/qt/gfc_sjose.htm	2	5	BRIEF_COUNSELING	4	www.lungsrus.org	5	9	17
Jane-15-SC	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	17
Jane-16-PO	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	19
Jane-17-YL	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	19
Jane-18-RS	1	PHYSICAL_INTENSIVE_INPATIENT	1	www.addictionsearch.com/treatment_facilities/act-consulting-services_2122.html	1	2	ADVICE	5	www.stopsmokinghypnosiscenter.com	3	8	50
Jane-19-ZJ	1	OUT_PATIENT	3	alcoholism.about.com/od/tx_ca/qt/gfc_sjose.htm	3	6	BRIEF_COUNSELING	4	www.lungsrus.org	5	9	17
Jane-1-DJ	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	OUT_PATIENT	3	Last Stop Smoking	1	4	23
Jane-20-XF	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	17
Jane-21-PI	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	29
Jane-22-OB	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	OUT_PATIENT	3	Last Stop Smoking	1	4	23
Jane-23-QJ	1	OUT_PATIENT	3	N/A	0	3	BRIEF_COUNSELING	4	N/A	0	4	19
Jane-24-EK	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	20
Jane-25-MV	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	OUT_PATIENT	3	Last Stop Smoking	1	4	22
Jane-26-KK	1	OUT_PATIENT	3	N/A	0	3	ADVICE	5	N/A	0	5	25
Jane-27-OZ	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	ADVICE	5	Last Stop Smoking	1	6	32
Jane-28-JO	1	N/A	0	N/A	0	0	N/A	0	N/A	0	0	19
Jane-29-FS	1	N/A	0	N/A	0	0	N/A	0	N/A	0	0	15
Jane-2-ZW	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	ADVICE	5	Last Stop Smoking	1	6	19
Jane-30-BC	1	N/A	0	N/A	0	0	N/A	0	N/A	0	0	20
Jane-31-PF	1	N/A	0	N/A	0	0	N/A	0	N/A	0	0	20
Jane-3-TE	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	18
Jane-4-UF	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	30
Jane-5-ZQ	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	23
Jane-6-BX	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	20
Jane-71-EU	1	ADVICE	4	N/A	0	4	ADVICE	5	Last Stop Smoking	1	6	35
Jane-72-YF	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	BRIEF_COUNSELING	4	Last Stop Smoking	1	5	41
Jane-73-FF	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	ADVICE	5	Last Stop Smoking	1	6	21
Jane-74-GR	1	N/A	0	N/A	0	0	N/A	0	N/A	0	0	15
Jane-75-FK	1	OUT_PATIENT	3	www.supportsystemshomes.com	3	6	ADVICE	5	Last Stop Smoking	1	6	20
Jane-7-HT	1	ADVICE	4	www.aasanjose.org/new_development/	1	5	OUT_PATIENT	3	Last Stop Smoking	1	4	18
Jane-8-XH	1	BRIEF_COUNSELING	5	N/A	0	5	BRIEF_COUNSELING	4	N/A	0	4	30
Jane-9-EW	1	OUT_PATIENT	3	alcoholism.about.com/od/tx_ca/qt/gfc_sjose.htm	2	5	ADVICE	5	www.stopsmokinghypnosiscenter.com	3	8	14
John-10-HQ	1	PHYSICAL_INTENSIVE_INPATIENT	5	www.adventgm.com	1	6	OUT_PATIENT	3	www.lungsrus.org	4	7	19
John-11-OY	1	PHYSICAL_INTENSIVE_INPATIENT	5	www.adventgm.com	1	6	BRIEF_COUNSELING	5	stopsmoking.stanford.edu	5	10	25
John-12-1K	1	PHYSICAL_INTENSIVE_INPATIENT	5	www.adventgm.com	1	6	OUT_PATIENT	3	www.lungsrus.org	4	7	22
John-13-	1	PHYSICAL_I	5	www.adventgm.com	1	6	OUT_PATIENT	3	www.lungsrus.org	4	7	14

Heuristic Health Resource Referral (H2R2) Engine

WO		NTENSIVE_I N_PATIENT			NT					
John-14-CV	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 17
John-15-JW	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 17
John-16-RU	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	BRIEF_COU NSELING	5	stopsmoking.stanford.e du	5 10 19
John-17-BX	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	BRIEF_COU NSELING	5	stopsmoking.stanford.e du	5 10 19
John-18-YY	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	N/A	0	5	N/A	0	N/A	0 0 50
John-19-QN	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 17
John-1-TH	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 23
John-20-LQ	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	N/A	0	N/A	0 0 17
John-21-KK	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	BRIEF_COU NSELING	5	stopsmoking.stanford.e du	5 10 29
John-22-DJ	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	ADVICE	4	www.lungsrus.org	4 8 23
John-23-FJ	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	ADVICE	4	www.lungsrus.org	4 8 19
John-24-HU	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 20
John-25-NV	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	ADVICE	4	www.lungsrus.org	4 8 22
John-26-PE	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	BRIEF_COU NSELING	5	stopsmoking.stanford.e du	5 10 25
John-27-WC	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 32
John-28-JP	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	BRIEF_COU NSELING	5	stopsmoking.stanford.e du	5 10 19
John-29-GP	1	N/A	0	N/A	0	0	N/A	0	N/A	0 0 15
John-2-ZB	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	N/A	0	5	BRIEF_COU NSELING	5	N/A	0 5 19
John-30-CN	1	N/A	0	N/A	0	0	N/A	0	N/A	0 0 20
John-31-RG	1	N/A	0	N/A	0	0	N/A	0	N/A	0 0 20
John-3-JQ	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 18
John-4-NM	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 30
John-5-CG	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 23
John-6-OI	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	BRIEF_COU NSELING	5	stopsmoking.stanford.e du	5 10 20
John-71-KW	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 35
John-72-BI	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 41
John-73-QB	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 21
John-74-VM	1	N/A	0	N/A	0	0	N/A	0	N/A	0 0 15
John-75-DN	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	BRIEF_COU NSELING	5	stopsmoking.stanford.e du	5 10 20
John-7-RI	1	PHYSICAL_I NTENSIVE_I N_PATIENT	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 18
John-8-LB	1	PHYSICAL_I NTENSIVE_I	5	www.adventgm.com	1	6	OUT_PATIE NT	3	www.lungsrus.org	4 7 30

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John-9-XE	1	N PATIENT PHYSICAL_I NTENSIVE_I N PATIENT	5	www.adventgm.com	1	6	N/A	0	N/A	0	0	14
Jane-1- WIWY	2	BRIEF_COU NSELING	5	www.sanjoeseaddictioncounseling.com/ sjaddict/	3	8	BRIEF_COU NSELING	4	www.sanjoeseaddictionc ounseling.com/sjaddict/	3	7	19
Jane-24- BJZE	2	N/A	0	N/A	0	0	N/A	0	N/A	0	0	30
Jane-2- RNFB	2	ADVICE	4	www.medicinenet.com	1	5	ADVICE	5	www.cancer.org	5	10	11
Jane-3- CIIT	2	BRIEF_COU NSELING	5	www.bettyfordcenter.org/	1	6	OUT_PATIE NT	3	www.hopkinshospital.o rg/health_info/Heart/Pr ograms/cicarone.html	1	4	24
Jane-48- WIWZ	2	ADVICE	4	einearticles.com/?The-Road-To- Sober---Quitting-The-Alcohol-Before- It-Consumes-You- Completely&id=962612	4	8	ADVICE	5	www.ec- online.net/Knowledge/ Articles/quitsmoking.ht ml	5	10	10
Jane-49- FRMZ	2	ADVICE	4	alcoholism.about.com/cs/info/a/aa0423 97.htm	2	6	ADVICE	5	www.rd.com/living- healthy/25-ways-to- stop-smoking- cigarettes/article16127. html	5	10	10
Jane-4- CBEK	2	ADVICE	4	alcoholism.about.com/cs/about/f/faq11 .htm	4	8	ADVICE	5	www.smokehelp.org/ht ml/help_with_quitting.h tml	5	10	8
Jane-50- OEAT	2	ADVICE	4	www.edtreatmentcenters.com/addictio n-help.php	1	5	BRIEF_COU NSELING	4	www.mayoclinic.org/st op-smoking/	1	5	22
Jane-51- DSUR	2	BRIEF_COU NSELING	5	www.oasistropical1.com/	1	6	BRIEF_COU NSELING	4	www.drnicely.com/inde x.html?gclid=CJrfoszS- pYCFQ0xawodEBk1Z A	4	8	22
Jane-52- PREQ	2	PHYSICAL_I NTENSIVE_I N PATIENT	1	www.cs.sjsu.edu	0	1	OUT_PATIE NT	3	www.psych.sjsu.edu	0	3	8
Jane-53- COKM	2	ADVICE	4	www.sanjoesealcoholismcounseling.co m/alcohol/withdrawal.htm	3	7	BRIEF_COU NSELING	4	meeting.chestjournal.or g/cgi/content/abstract/1 32/4/527b	3	7	9
Jane-54- QGNF	2	ADVICE	4	www.spencerrecovery.com/?gclid=CK 3i_DS-pYCFSAUagod80EeZg	1	5	ADVICE	5	www.becomeanex.org/# learn_overview	5	10	9
Jane-55- YIWB	2	ADVICE	4	www.aa.org	2	6	ADVICE	5	smokefree.gov	5	10	8
Jane-56- EBYJ	2	OUT_PATIE NT	3	www.alcoholism.com	2	5	BRIEF_COU NSELING	4	www.smokehelp.com	0	4	9
Jane-57- ZSXF	2	ADVICE	4	www.alcoholadvice.com/	5	9	BRIEF_COU NSELING	4	www.acpm.org/tobpol.h tm	2	6	19
Jane-58- ARJB	2	ADVICE	4	alcoholism.about.com/od/support/How _to_Quit_Alcohol_and_Drugs.htm	4	8	ADVICE	5	quitsmoking.about.com/ od/tipsforquitting/Tips to_Help_You_Quit_Sm oking_Cigarettes.htm	5	10	10
Jane-59- EDVX	2	N/A	0		0	0	BRIEF_COU NSELING	4	www.drug- addiction.com/drugs_an d_denial.htm	1	5	19
Jane-5- TOLU	2	PHYSICAL_I NTENSIVE_I N PATIENT	1	www.cs.sjsu.edu	0	1	OUT_PATIE NT	3	www.psych.sjsu.edu	0	3	6
Jane-60- BPRY	2	PHYSICAL_I NTENSIVE_I N PATIENT	1	www.cs.sjsu.edu	0	1	OUT_PATIE NT	3	www.psych.sjsu.edu	0	3	15
Jane-61- JGEP	2	PHYSICAL_I NTENSIVE_I N PATIENT	1	www.cs.sjsu.edu	0	1	OUT_PATIE NT	3	www.psych.sjsu.edu	0	3	4
Jane-62- ERUK	2	ADVICE	4	www.camprecovery.com/	3	7	BRIEF_COU NSELING	4	articles.directory.com/ A_quitter_can_be_a_wi nner_Campbell_CA- r938260- Campbell_CA.html	2	6	16
Jane-63- GQPP	2	N/A	0		0	0	BRIEF_COU NSELING	4	www.quitnet.com/	5	9	16
Jane-64- INMK	2	BRIEF_COU NSELING	5	www.addictionsearch.com/treatment_f acilities/city/san-jose/CA/alcohol-and- drug-abuse-information-and- treatment_1.html	3	8	BRIEF_COU NSELING	4	whyquit.com/joel/Joel_ 01_13_gradual_withdra wal.html	5	9	11
Jane-65- DVQP	2	BRIEF_COU NSELING	5	www.cs.sjsu.edu	0	5	BRIEF_COU NSELING	4	askville.amazon.com/el ectronic-cigarette-help- smokers- quit/AnswerViewer.do? requestId=18067559	1	5	8
Jane-66- PCKL	2	ADVICE	4	www.stopdrinkingadvice.org/the- dangers-of-binge-drinking/	5	9	ADVICE	5	lifetrend.com/info.htm	3	8	16
Jane-67- DBMC	2	BRIEF_COU NSELING	5	www.aa.org	2	7	ADVICE	5	www.gracermedicalgro up.com	2	7	12
Jane-68- RUHW	2	BRIEF_COU NSELING	5	www.harmonyplace.net/s/index.html?s rc=GGL&gclid=CLKow7rb- pYCFRsRagodJgltYQ	2	7	ADVICE	5		0	5	13
Jane-69- NKVF	2	ADVICE	4	www.dryoutnow.com	1	5	BRIEF_COU NSELING	4	www.quit4good.com	5	9	12
Jane-6- BEKF	2	ADVICE	4	www.habitdoc.com/	2	6	ADVICE	5	www.lungusa.org/site/c. dvLUK9O0E/b.33567/k .B594/Quitting_Smokin g.htm	4	9	6

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Jane-70-MKHE	2	ADVICE	4	www.way2quit.com/Not_Ready.aspx	5	9	ADVICE	5	www.dryoutnow.com/binge-drinking/	0	5	26
Jane-71-YGQI	2	N/A	0	N/A	0	0	N/A	0	N/A	0	0	18
Jane-72-MWYA	2	ADVICE	4	psychcentral.com/ask-the-therapist/2008/06/30/how-can-i-quit-drinking/	5	9	ADVICE	5	WhyQuit.com	5	10	17
Jane-73-NKTP	2	ADVICE	4	www.stopdrinkingadvice.org/	4	8	BRIEF_COUSNELING	4	www.phc-inc.com/tobacco_cessation.asp	5	9	13
Jane-74-QRAL	2	ADVICE	1		0	1	BRIEF_COUSNELING	4	www.smokefree.gov/	5	9	20
Jane-75-QQIM	2	BRIEF_COUSNELING	5	www2.potsdam.edu	0	5	ADVICE	5		0	5	13
Jane-7-XRTG	2	ADVICE	4	www.virtualrespiratorycentre.com	0	4	ADVICE	5	zenhabits.net	2	7	20
Jane-8-RHFO	2	ADVICE	4	www.buzzle.com/articles/stop-drinking-advice-withdrawal-symptoms-need-medical-advice.html	4	8	ADVICE	5	advice7.com/health_fitness/smoking.html	5	10	13
Jane-9-RQPO	2	ADVICE	4		0	4	ADVICE	5	smokefree.gov	5	10	10
John-1-WIWI	2	IN_PATIENT	5	www.camprecure.com/	4	9	BRIEF_COUSNELING	5	www.sanjoseaddictioncounseling.com/sjaddict/	4	9	19
John-24-BJZE	2	N/A	0	N/A	0	0	N/A	0	N/A	0	0	30
John-2-RNFB	2	INTENSIVE_OUT_PATIENT	3	alcoholism.about.com	3	6	BRIEF_COUSNELING	5	www.associatedcontent.com	3	8	11
John-3-CIIT	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	www.drug-rehabcenter.com/substance_abuse_treatment.htm	1	6	OUT_PATIENT	3	www.drug-rehabs.com/cigarette-smuggling.htm	2	5	24
John-48-WIWZ	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	www.addict-help.com/	3	8	BRIEF_COUSNELING	5	www.quitnet.com/	4	9	10
John-49-FRMZ	2	INTENSIVE_OUT_PATIENT	3	www.addict-help.com/	3	6	BRIEF_COUSNELING	5	www.quitnet.com/	4	9	10
John-4-CBEK	2	BRIEF_COUSNELING	2	www.passagesmalibu.com/drug-alcohol-treatment-program.html?cpao=111&cpca=bm3&cpag=dabusebm&kw=drugnalcobuse&gclid=CI3YuZve-pYCFQkiagodsjsGXg	2	4	BRIEF_COUSNELING	5	www.passagesmalibu.com/drug-alcohol-treatment-program.html?cpao=111&cpca=bm3&cpag=dabusebm&kw=drugnalcobuse&gclid=CI3YuZve-pYCFQkiagodsjsGXg	1	6	8
John-50-OEAT	2	IN_PATIENT	5	www.baysidemarin.com/bayside/index.php	4	9	BRIEF_COUSNELING	5	www.schickshadel.com/nicotine-addiction.html	0	5	22
John-51-DSUR	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	www.spencerrecovery.com/	3	8	OUT_PATIENT	3	www.sierratuson.com/programs_adactions.php?source=adwords&gclid=CNjxhlt-pYCFRNOagod_CBJXw	1	4	22
John-52-PREQ	2	ADVICE	1	www.duydaovo.com	0	1	ADVICE	4		0	4	8
John-53-COKM	2	IN_PATIENT	5	www.hopelinks.net/drug-treatment/california/95112.html	4	9	OUT_PATIENT	3	www.addictionca.com/contact2.htm?state=California&city=San_Jose-328k-	2	5	9
John-54-QGNF	2	BRIEF_COUSNELING	2	www.womensheart.org/content/HeartDisease/alcohol_and_heart_disease.asp	1	3	ADVICE	4	www.chantix.com/content/About_Chantix.jsp?setShowOn=../content/About_Chantix.jsp&setShowHighlightOn=../content/About_Chantix.jsp&source=google&HBX_PK=s_cigarette+addiction&HBX_OU=50&o=231195691663735250	3	7	9
John-55-YIWB	2	IN_PATIENT	5	www.aa.org	3	8	BRIEF_COUSNELING	5	smokefree.gov	4	9	8
John-56-EBYJ	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	www.addict-help.com	4	9	BRIEF_COUSNELING	5	www.stop-smoking.com	0	5	9
John-57-ZSXF	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	alcoholism.about.com/od/about/a/treatment.htm	3	8	OUT_PATIENT	3	quitsmoking.about.com/od/preparetoquit/Prepare_for_Success_Develop_a_Plan_to_Help_You_Quit_Smoking.htm	4	7	19
John-58-ARJB	2	OUT_PATIENT	3	aa.org	3	6	ADVICE	4	quitsmoking.about.com/od/tipsforquitting/Tips_to_Help_You_Quit_Smoking_Cigarettes.htm	4	8	10
John-59-EDVX	2	ADVICE	1	alcoholism.about.com/cs/about/f/faq12.htm	2	3	N/A	0		0	0	19
John-5-TOLU	2	ADVICE	1	www.duybaovo.com	0	1	ADVICE	4		0	4	6
John-60-BPRY	2	ADVICE	1	www.buybaovo.com	0	1	ADVICE	4		0	4	15

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John-61-JGEP	2	ADVICE	1	www.duybaovo.com	0	1	ADVICE	4	0	4	4	
John-62-ERUK	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	www.positiveprogression.org/index.html	4	9	ADVICE	4	articles.directory.net/How_to_Quit_Smoking_San_Jose_CA-r861316-San_Jose_CA.html	4	8	16
John-63-GQPP	2	OUT_PATIENT	3	www.addictionca.com/contact2.htm?state=California&city=San_Jose	3	6	OUT_PATIENT	3	www.addictionca.com/contact2.htm?state=California&city=San_Jose	2	5	16
John-64-INMK	2	IN_PATIENT	5	www.addictionsearch.com/treatment_facilities/city/san-jose/CA/alcohol-and-drug-abuse-information-and-treatment_1.html	3	8	OUT_PATIENT	3	whyquit.com/	4	7	11
John-65-DVQP	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	duybaovao.com	0	5	BRIEF_COUNSELING	5	www.smokehelp.org/	4	9	8
John-66-PCKL	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	treatmentcenters.com/	4	9	ADVICE	4	www.articlesbase.com/quit-smoking-articles/quit-smoking-the-medical-reasons-121708.html	2	6	16
John-67-DBMC	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	www.addictionca.com	3	8	ADVICE	4	www.gracermedicalgroup.com	2	6	12
John-68-RUHW	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	www.passagesmalibu.com/drug-alcohol-treatment-program.html?cpao=111&cpca=bmv3&cpag=atreatmentbm&kw=alcohol treatment&gclid=CN-fls7a-pYCFQQCagoduHZIXw	3	8	BRIEF_COUNSELING	5	www.smokefreelife.com/?gclid=CKeB66Db-pYCFR8xNagodHR10Yg	3	8	13
John-69-NKVF	2	INTENSIVE_OUT_PATIENT	3	www.soberrecovery.com	3	6	BRIEF_COUNSELING	5	www.quit4good.com	4	9	12
John-6-BEKF	2	IN_PATIENT	5	www.soberrecovery.com/	3	8	BRIEF_COUNSELING	5	www.smokefree.gov/expert.html	4	9	6
John-70-MKHE	2	OUT_PATIENT	3	www.rehabandtreatment.com/?cpao=111&cpca=General_DualX1&cpag=29130175&kw=intensive_outpatient_treatment	3	6	OUT_PATIENT	3	www.sfrecoverschool.com/	4	7	26
John-71-YGQI	2	N/A	0	N/A	0	0	N/A	0	N/A	0	0	18
John-72-MWYA	2	BRIEF_COUNSELING	2	alcoholism.about.com/od/support/How_to_Quit_Alcohol_and_Drugs.htm	3	5	ADVICE	4	www.dsf.health.state.pa.us/health/cwp/view.asp?A=174&Q=236106	4	8	17
John-73-NKTP	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	www.RehabAndTreatment.com	3	8	BRIEF_COUNSELING	5	www.phc-inc.com/tobacco_cessation.asp	4	9	13
John-74-QRAL	2	INTENSIVE_OUT_PATIENT	4	www.comcareserv.org/pdf/aiop.pdf	3	7	BRIEF_COUNSELING	5	www.drug-rehabs.com/	2	7	20
John-75-QQIM	2	PHYSICAL_INTENSIVE_IN_PATIENT	5	www.gdcada.org/statistics/alcohol.htm	1	6	BRIEF_COUNSELING	5	www.photovault.com	0	5	13
John-7-XRTG	2	ADVICE	1	www.alcoholism.about.com	3	4	ADVICE	4	www.dassa.sa.gov.au	4	8	20
John-8-RHFO	2	BRIEF_COUNSELING	2	www.pachills.com/?cpao=111&cpca=California&cpag=san+francisco&kw=san+francisco+alcohol+treatment	3	5	BRIEF_COUNSELING	5	www.selfgrowth.com/articles/How_Cigarettes_Kill.html	2	7	13
John-9-RQPO	2	INTENSIVE_OUT_PATIENT	3	alcoholism.about.com/od/withdraw/a/a040604.htm	3	6	ADVICE	4	smokefree.gov	4	8	10

Table 9 - Tabulated Result from Experiment

The user data was randomly assigned an identifier known only to the author. Using this identify, Dr. Laraway assigned scores to the suggested care and resources. The anchors were determined using an inter-rater reliability method with an independently rater, Dr. Susan Snycerski (Psychology Instructor, San José State University, Susan.Snycerski at sjsu dot edu). Using a sample size of approximately 20% of the test subjects and the simple agreement method ($\text{Agreement} / (\text{Agreement} + \text{Disagreement})$), Dr.'s Laraway and Snycerski were 86.67% in agreement about the scores of the Alcohol Suggested Care, 73.33% in agreement about the Alcohol Resource, 100% in agreement about the Cigarette

Suggested Care, and 73.33% in agreement about the Cigarette Resource. The following scoring system was employed:

Suggested Care: John's Alcohol Suggested Care: Physical Intensive In-Patient John's Cigarette Suggested Care: Brief Counseling Jane's Alcohol Suggested Care: Brief Counseling Jane's Cigarette Suggested Care: Advice	Scoring: Based on the anchor, each suggested care was given a score between 0 and 5. 0 is absent, 1 is least appropriate, and 5 is very appropriate.
Suggested resource is rated on the appropriateness of the resource based on the following factors: 1. cost of treatment 2. treatment center's distance from person's residence 3. relevance of treatment to substance use	Scoring: 0 – Irrelevant / Page could not open 1 – Not appropriate 2 – Somewhat appropriate 3 – Moderately appropriate 4 – Mostly appropriate 5 – Very appropriate
Overall score is the sum of the suggested care score and the suggested resource score.	The maximum overall score is 10 for alcohol and 10 for cigarette components.

Table 10 - Data Scoring Table

5.3 Interpretation

With the original data (OD-series), H2R2E users scored slightly higher than their Search counterparts (mean score of 3.542 vs. 3.382) for the Alcohol Suggested Care. However, H2R2E users scored significantly lower than their Search counterparts (mean score of 1.458 vs. 2.118) for the Alcohol Resource. This is because H2R2E has a list of health resources that are matched on certain conditions (city, type of substance abuse,...), but there is no measurement for which of the matches is most appropriate. That is, all matches are treated equally. However, Search users could better distinguish which of the health resources matter more based on other factors which are found on the website of the resource. The lower Alcohol Resource score produced an overall mean score that is lower for H2R2E users than their Search counterparts (5.000 vs. 5.500).

Of the 72 H2R2E entries (2 for each test subject), 9 of them were not completed compared to the 4 entries that were not completed for the Search users. If we compared the results of those who did complete the tasks (the F-series), H2R2E users scored significantly higher (4.048 vs. 3.569). However, H2R2E users still scored significantly lower on the Alcohol Resource (1.667 vs. 2.236), resulting in a slightly lower overall mean score for the H2R2E group (5.714 vs. 5.806).

With the original data (OD-series), H2R2E group had a significantly lower mean score on the Cigarette Suggested Care (3.292 vs. 4.013), significantly lower mean score on the Cigarette Resource (2.222 vs. 2.539), and significantly lower mean score on the overall cigarette rating (5.514 vs. 6.553). Using the finished data set

(F-series), the H2R2E group still scored significantly lower (3.762 vs. 4.236) on the Cigarette Suggested Care, slightly lower on the Cigarette Resource (2.540 vs. 2.681), and significantly lower on the overall score (6.302 vs. 6.917).

The author did notice that one of the cigarette resources was highly inappropriate; the first search result on Google for “Last Stop Smoking” turned out to be a site for individuals to purchase tobacco-related products. Unfortunately, the resource found its way into the H2R2E database, and was consistently being returned for 24 of the 72 test cases. The L-series contained F-series data where the “Last Stop Smoking” was not returned. With the L-series, the H2R2E group still scored significantly lower (3.564 vs. 4.236) on the Cigarette Suggested Care, significantly higher on the Cigarette Resource (3.487 vs. 2.681), and slightly higher on the overall score (7.051 vs. 6.917).

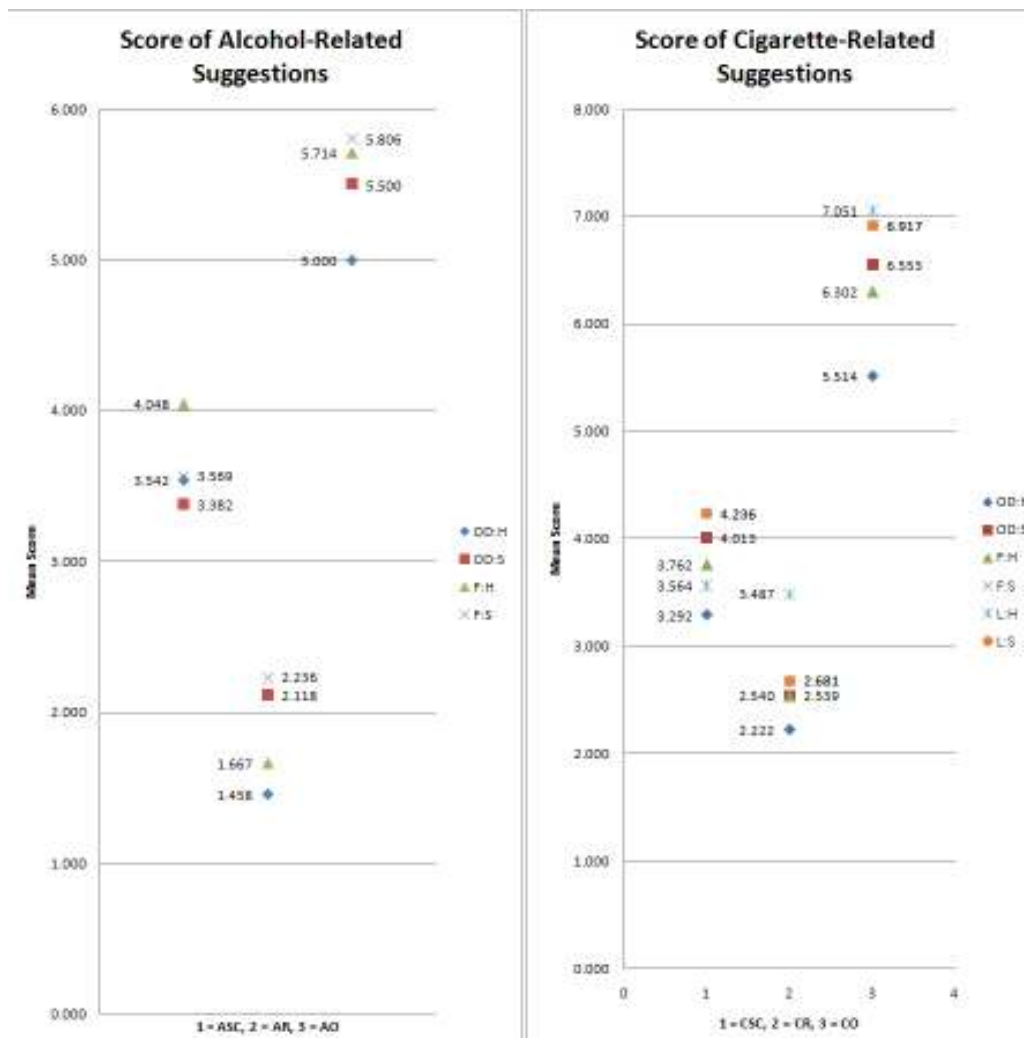


Figure 13 - Graph of Mean Scores

Despite best-efforts, the UI still require additional work. We did not anticipate users' difficulties employing the many checkboxes and buttons found in the application. A wizard-based approach might have been more efficient because users tend not to want to read directions. The result is a significantly longer amount of time spent for H2R2E than for Search groups.

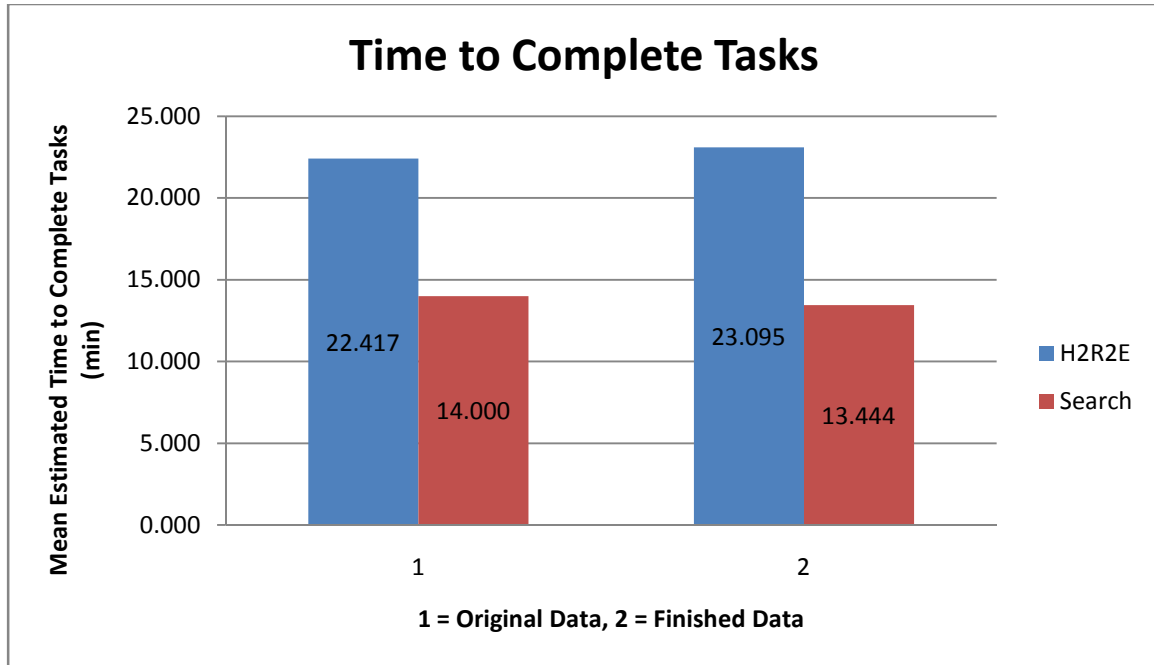


Figure 14 - Mean Time to Complete Tasks

6 CONCLUSION

We believe that the Alcohol Suggested Care measurement demonstrated the utility of the engine. By combining the results of three different tests for alcohol dependency, we were able to arrive at the correct diagnosis 4 / 5 of the time. If we had a more expansive database of health resources with additional dimensions of compatibility between health resources and individuals, we believe that we can provide better matches.

Our shortcoming on the Cigarette Suggested Care stems from the fact that we had only one (1) test, with questions that were relatively difficult for the user to understand. With the alcohol component, we were able to use results from three tests. Since our test subjects did not have an incentive to perform well, we felt the harder questions were ignored in the Cigarette Dependency Scale. We believe that if we had more tests, we can better assess the user's needs. With the exception of the "Last Smoking Resource," we were content with the appropriateness of the Cigarette Resource recommendations.

We believe that a more intuitive UI combined with a larger database of health resources and additional tests for cigarette dependency will produce a much more accurate result set. For now, our application has demonstrated the utility of fuzzy logic in diagnosing and referring individuals to alcohol resources.

7 FUTURE WORK

We believe that additional work in UI design is necessary to enhance the utility of the application. We should attempt to utilize a wizard-based system. It is highly desirable for us to implement additional non-fuzzy variables like location and fuzzy variables including BMI and exercise amount into our systems to get a more holistic picture of the user's health. The variables have already been built into the system, but we did not have time to consider them in our trials and develop rules. We can also expand current variables including sex to cover more than just males and females. We would also like to add to the battery of existing tests, especially for cigarette dependency.

In their paper, Ganguly *et al.* proposed a workflow-based approach towards health care whereby different health resources (hospitals, health services, medical devices,...) can better serve the patient in conjunction with a process-based service model. They defined their workflow model as a collection of subcomponents including 1) sub processes, 2) tasks, 3) relationships among tasks, and 4) required roles. A case study with Electrocardiography (ECG) was conducted whereby an ECG machine transmits its information to a distributed knowledge repository which then forwards the different interpretation to an online supervisory cardiologist [30]. Such seamless interchange of health information is a holy grail of electronic health information systems. Our system should be able to maintain some history information about a patient's health record so that it could determine which resources to refer the individual to. We should provide this information (assuming proper authentication and authorization) to other providers to maximize the benefits of users.

Our application can also service more niche communities. For example, it can employ geriatric depression scales or provide information specifically suited to the Lesbian, Gay, Bisexual, Transgender (LGBT) community.

Using zip-code look-up web services, we can make our application more relevant to a user's location. We should be able to find services that are closest to the user. Information like the AMI for the area can be considered based on the user's zip code. Finally, we can infer additional risks based on the user's location. For example, an article by the Sustainable Food Laboratory asserted that low-income urban areas tend to have poor access to quality food and that diabetes in these areas is rising rapidly [31]. By leveraging location-specific rules, we can build a location-based service that is much more relevant for the user.

APPENDIX A – BIBLIOGRAPHY

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APPENDIX B – DATABASE SCHEMA

Generated with *mysqldump*

(<http://dev.mysql.com/doc/refman/5.0/en/mysqldump.html>)

```
-- MySQL dump 10.11
--
-- Host: localhost    Database: hygeia
-----
-- Server version      5.0.45-community-nt

/*!40101 SET @OLD_CHARACTER_SET_CLIENT=@@CHARACTER_SET_CLIENT */;
/*!40101 SET @OLD_CHARACTER_SET_RESULTS=@@CHARACTER_SET_RESULTS */;
/*!40101 SET @OLD_COLLATION_CONNECTION=@@COLLATION_CONNECTION */;
/*!40101 SET NAMES utf8 */;
/*!40103 SET @OLD_TIME_ZONE=@@TIME_ZONE */;
/*!40103 SET TIME_ZONE='+00:00' */;
/*!40014 SET @OLD_UNIQUE_CHECKS=@@UNIQUE_CHECKS, UNIQUE_CHECKS=0 */;
/*!40014 SET @OLD_FOREIGN_KEY_CHECKS=@@FOREIGN_KEY_CHECKS, FOREIGN_KEY_CHECKS=0 */;
/*!40101 SET @OLD_SQL_MODE=@@SQL_MODE, SQL_MODE='NO_AUTO_VALUE_ON_ZERO' */;
/*!40111 SET @OLD_SQL_NOTES=@@SQL_NOTES, SQL_NOTES=0 */;

--
-- Table structure for table `activityinformation`
--

DROP TABLE IF EXISTS `activityinformation`;
CREATE TABLE `activityinformation` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `hoursOfExerciseAWeek` double default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `activityinformation`
--

LOCK TABLES `activityinformation` WRITE;
/*!40000 ALTER TABLE `activityinformation` DISABLE KEYS */;
INSERT INTO `activityinformation` VALUES ('ac003dc1-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,2);
/*!40000 ALTER TABLE `activityinformation` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `address`
--

DROP TABLE IF EXISTS `address`;
CREATE TABLE `address` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `city` varchar(255) NOT NULL,
  `isPrimary` bit(1) default NULL,
  `state` varchar(255) NOT NULL,
  `streetAddress1` varchar(255) NOT NULL,
  `streetAddress2` varchar(255) default NULL,
  `type` varchar(255) NOT NULL,
  `zipCode1` varchar(255) NOT NULL,
  `zipCode2` varchar(255) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `address`
--

LOCK TABLES `address` WRITE;
/*!40000 ALTER TABLE `address` DISABLE KEYS */;
INSERT INTO `address` VALUES ('ac003db3-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,'San Jose','CA','5552 Sunspring Circle','NULL','HOME','95138','NULL'),('ac003db4-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,'Santa Clara','NULL','CA','321 Some Other Street','NULL','WORK','54321','NULL'),('ac3e3126-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,'San Jose','CA','782 Park Ave','WORK','95126',''),('ac40a229-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Campbell','CA','274 E. Hamilton Ave','Suite D','WORK','95008',''),('ac40a22c-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'San Jose','CA','160 East Virginia Street','Suite 266','WORK','95112',''),('ac40a22f-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'San Jose','CA','466 South Buena Vista
```


Heuristic Health Resource Referral (H2R2) Engine

```
Avenue','WORK','95126','),(ac40a233-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'San Jose','CA','9505 Malech
Road','WORK','95138','),(ac40a236-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Santa Clara','CA','2901 Moorpark
Avenue','Suite 294','WORK','95128','2505'),(ac40a239-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'San Jose','CA','976 Lenzen
Avenue','1st Floor','WORK','95126','),(ac40a23c-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'San Jose','CA','2425 Enborg
Ln','WORK','95128','),(ac40a23f-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Mountain View','CA','2500 Grant Road ECH
133','WORK','94040','),(ac40a242-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Gilroy','CA','8475 Forest
Street','WORK','95020','),(ac40a245-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Campbell','CA','1 West Campbell
Avenue','Suite E-43','WORK','95008','),(ac40a248-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Palo Alto','CA','231 Grant
Avenue','Room 150','WORK','94306','),(ac40a24b-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'San Jose','CA','102 South 11th
Street','WORK','95112','),(ac40a24e-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Santa Clara','CA','1659 Scott
Boulevard','Suite 30','WORK','95050','),(ac40a251-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'San Jose','CA','90 Great Oaks
Blvd','Suite 108','WORK','95119','),(ac40a255-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'San Jose','CA','808 Palm
Street','WORK','95110','),(ac40a258-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Oakland','CA','2551 San Pablo
Avenue','Second Floor','WORK','94607','),(ac40a25b-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Fremont','CA','4510 Peralta
Boulevard','Suite 1','WORK','94536','),(ac40a25e-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Fremont','CA','3775 Beacon
Avenue','Second Floor','WORK','94538','),(ac42ec51-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'Santa Clara','CA','1400
Coleman Avenue','Unit D14','WORK','95050','4317'),(ac42ec55-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,'San
Jose','CA','2674 North 1st Street','Suite 112','WORK','95134','),(ac42ec58-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin',0,'Campbell','CA','831 Gale Dr','Apt 47','WORK','95008','0931'),(ac42ec5b-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin',0,'San Francisco','CA','1863 Union Street','WORK','94123',');
/*140000 ALTER TABLE `address` ENABLE KEYS */;
UNLOCK TABLES;
```

```
--
-- Table structure for table `cghq28data`
--
```

```
DROP TABLE IF EXISTS `cghq28data`;
CREATE TABLE `cghq28data` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
```

```
--
-- Dumping data for table `cghq28data`
--
```

```
LOCK TABLES `cghq28data` WRITE;
/*140000 ALTER TABLE `cghq28data` DISABLE KEYS */;
/*140000 ALTER TABLE `cghq28data` ENABLE KEYS */;
UNLOCK TABLES;
```

```
--
-- Table structure for table `cghq28data_questionanswermmap`
--
```

```
DROP TABLE IF EXISTS `cghq28data_questionanswermmap`;
CREATE TABLE `cghq28data_questionanswermmap` (
  `CGHQ28Data_databaseId` varchar(255) NOT NULL,
  `element` int(11) default NULL,
  `mapkey` int(11) NOT NULL default '0',
  PRIMARY KEY (`CGHQ28Data_databaseId`,`mapkey`),
  KEY `FK49704176A0A61D57` (`CGHQ28Data_databaseId`),
  CONSTRAINT `FK49704176A0A61D57` FOREIGN KEY (`CGHQ28Data_databaseId`) REFERENCES `cghq28data` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
```

```
--
-- Dumping data for table `cghq28data_questionanswermmap`
--
```

```
LOCK TABLES `cghq28data_questionanswermmap` WRITE;
/*140000 ALTER TABLE `cghq28data_questionanswermmap` DISABLE KEYS */;
/*140000 ALTER TABLE `cghq28data_questionanswermmap` ENABLE KEYS */;
UNLOCK TABLES;
```

```
--
-- Table structure for table `cigarettedependencescale12`
--
```

```
DROP TABLE IF EXISTS `cigarettedependencescale12`;
CREATE TABLE `cigarettedependencescale12` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
```

```
--
-- Dumping data for table `cigarettedependencescale12`
--
```

```
LOCK TABLES `cigarettedependencescale12` WRITE;
/*140000 ALTER TABLE `cigarettedependencescale12` DISABLE KEYS */;
/*140000 ALTER TABLE `cigarettedependencescale12` ENABLE KEYS */;
UNLOCK TABLES;
```

Heuristic Health Resource Referral (H2R2) Engine

```
--
-- Table structure for table `cigarettedependencescale12_response`
--

DROP TABLE IF EXISTS `cigarettedependencescale12_response`;
CREATE TABLE `cigarettedependencescale12_response` (
  `CigaretteDependenceScale12_databaseId` varchar(255) NOT NULL,
  `element` varchar(255) default NULL,
  `mapkey` int(11) NOT NULL default '0',
  PRIMARY KEY (`CigaretteDependenceScale12_databaseId`,`mapkey`),
  KEY `FK508F6FE4D317FF7` (`CigaretteDependenceScale12_databaseId`),
  CONSTRAINT `FK508F6FE4D317FF7` FOREIGN KEY (`CigaretteDependenceScale12_databaseId`) REFERENCES `cigarettedependencescale12` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `cigarettedependencescale12_response`
--

LOCK TABLES `cigarettedependencescale12_response` WRITE;
/*!40000 ALTER TABLE `cigarettedependencescale12_response` DISABLE KEYS */;
/*!40000 ALTER TABLE `cigarettedependencescale12_response` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `consumption`
--

DROP TABLE IF EXISTS `consumption`;
CREATE TABLE `consumption` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `bingeDrinkPerWeek` int(11) default NULL,
  `drinksPerWeek` int(11) default NULL,
  `packsPerDay` double default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `consumption`
--

LOCK TABLES `consumption` WRITE;
/*!40000 ALTER TABLE `consumption` DISABLE KEYS */;
INSERT INTO `consumption` VALUES ('ac003dbe-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,NULL,20,NULL);
/*!40000 ALTER TABLE `consumption` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `contactinformation`
--

DROP TABLE IF EXISTS `contactinformation`;
CREATE TABLE `contactinformation` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `contactinformation`
--

LOCK TABLES `contactinformation` WRITE;
/*!40000 ALTER TABLE `contactinformation` DISABLE KEYS */;
INSERT INTO `contactinformation` VALUES ('ac003db0-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0);
/*!40000 ALTER TABLE `contactinformation` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `contactinformation_address`
--

DROP TABLE IF EXISTS `contactinformation_address`;
CREATE TABLE `contactinformation_address` (
  `ContactInformation_databaseId` varchar(255) NOT NULL,
  `addresses_databaseId` varchar(255) NOT NULL,
  PRIMARY KEY (`ContactInformation_databaseId`,`addresses_databaseId`),
  UNIQUE KEY `addresses_databaseId` (`addresses_databaseId`),
  KEY `FKF906EFA1AC560F1F` (`ContactInformation_databaseId`),
  KEY `FKF906EFA142568D7D` (`addresses_databaseId`),
  CONSTRAINT `FKF906EFA142568D7D` FOREIGN KEY (`addresses_databaseId`) REFERENCES `address` (`databaseId`),
  CONSTRAINT `FKF906EFA1AC560F1F` FOREIGN KEY (`ContactInformation_databaseId`) REFERENCES `contactinformation` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `contactinformation_address`
--
```

Heuristic Health Resource Referral (H2R2) Engine

```
--

LOCK TABLES `contactinformation_address` WRITE;
/*40000 ALTER TABLE `contactinformation_address` DISABLE KEYS */;
INSERT INTO `contactinformation_address` VALUES ('ac003db0-9b62-11dd-a694-001b770639be','ac003db3-9b62-11dd-a694-001b770639be'),('ac003db0-9b62-11dd-a694-001b770639be','ac003db4-9b62-11dd-a694-001b770639be');
/*40000 ALTER TABLE `contactinformation_address` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `contactinformation_emailaddress`
--

DROP TABLE IF EXISTS `contactinformation_emailaddress`;
CREATE TABLE `contactinformation_emailaddress` (
  `ContactInformation_databaseId` varchar(255) NOT NULL,
  `emailAddresses_databaseId` varchar(255) NOT NULL,
  PRIMARY KEY (`ContactInformation_databaseId`,`emailAddresses_databaseId`),
  UNIQUE KEY `emailAddresses_databaseId` (`emailAddresses_databaseId`),
  KEY `FK598DD12BAC560F1F` (`ContactInformation_databaseId`),
  KEY `FK598DD12B4C2F97B1` (`emailAddresses_databaseId`),
  CONSTRAINT `FK598DD12B4C2F97B1` FOREIGN KEY (`emailAddresses_databaseId`) REFERENCES `emailaddress` (`databaseId`),
  CONSTRAINT `FK598DD12BAC560F1F` FOREIGN KEY (`ContactInformation_databaseId`) REFERENCES `contactinformation` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `contactinformation_emailaddress`
--

LOCK TABLES `contactinformation_emailaddress` WRITE;
/*40000 ALTER TABLE `contactinformation_emailaddress` DISABLE KEYS */;
INSERT INTO `contactinformation_emailaddress` VALUES ('ac003db0-9b62-11dd-a694-001b770639be','ac003db1-9b62-11dd-a694-001b770639be'),('ac003db0-9b62-11dd-a694-001b770639be','ac003db2-9b62-11dd-a694-001b770639be');
/*40000 ALTER TABLE `contactinformation_emailaddress` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `contactinformation_phonenumber`
--

DROP TABLE IF EXISTS `contactinformation_phonenumber`;
CREATE TABLE `contactinformation_phonenumber` (
  `ContactInformation_databaseId` varchar(255) NOT NULL,
  `phoneNumbers_databaseId` varchar(255) NOT NULL,
  PRIMARY KEY (`ContactInformation_databaseId`,`phoneNumbers_databaseId`),
  UNIQUE KEY `phoneNumbers_databaseId` (`phoneNumbers_databaseId`),
  KEY `FK41F86F84C560F1F` (`ContactInformation_databaseId`),
  KEY `FK41F86F84C3AB7326` (`phoneNumbers_databaseId`),
  CONSTRAINT `FK41F86F84C3AB7326` FOREIGN KEY (`phoneNumbers_databaseId`) REFERENCES `phonenumber` (`databaseId`),
  CONSTRAINT `FK41F86F84C560F1F` FOREIGN KEY (`ContactInformation_databaseId`) REFERENCES `contactinformation` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `contactinformation_phonenumber`
--

LOCK TABLES `contactinformation_phonenumber` WRITE;
/*40000 ALTER TABLE `contactinformation_phonenumber` DISABLE KEYS */;
INSERT INTO `contactinformation_phonenumber` VALUES ('ac003db0-9b62-11dd-a694-001b770639be','ac003db5-9b62-11dd-a694-001b770639be'),('ac003db0-9b62-11dd-a694-001b770639be','ac003db6-9b62-11dd-a694-001b770639be'),('ac003db0-9b62-11dd-a694-001b770639be','ac003db7-9b62-11dd-a694-001b770639be');
/*40000 ALTER TABLE `contactinformation_phonenumber` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `emailaddress`
--

DROP TABLE IF EXISTS `emailaddress`;
CREATE TABLE `emailaddress` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `address` varchar(255) NOT NULL,
  `isPrimary` bit(1) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `emailaddress`
--

LOCK TABLES `emailaddress` WRITE;
/*40000 ALTER TABLE `emailaddress` DISABLE KEYS */;
INSERT INTO `emailaddress` VALUES ('ac003db1-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin','0','carpe-diem@goodchr.com',NULL),('ac40a231-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin','0','info@amicushouse.com',''),('ac40a253-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin','0','info@adventgm.com',''),('ac42ec53-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin','0','info@stopsmokinghypnosiscenter.com',''),('ac42ec5d-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin','0','info@quintstantly.com','');
/*40000 ALTER TABLE `emailaddress` ENABLE KEYS */;
UNLOCK TABLES;
```

Heuristic Health Resource Referral (H2R2) Engine

```
--
-- Table structure for table `empiricallybasedalcoholdependencescale`
--

DROP TABLE IF EXISTS `empiricallybasedalcoholdependencescale`;
CREATE TABLE `empiricallybasedalcoholdependencescale` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `empiricallybasedalcoholdependencescale`
--

LOCK TABLES `empiricallybasedalcoholdependencescale` WRITE;
/*!40000 ALTER TABLE `empiricallybasedalcoholdependencescale` DISABLE KEYS */;
INSERT INTO `empiricallybasedalcoholdependencescale` VALUES ('ac003dbd-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0);
/*!40000 ALTER TABLE `empiricallybasedalcoholdependencescale` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `empiricallybasedalcoholdependencescale_response`
--

DROP TABLE IF EXISTS `empiricallybasedalcoholdependencescale_response`;
CREATE TABLE `empiricallybasedalcoholdependencescale_response` (
  `EmpiricallyBasedAlcoholDependenceScale_databaseId` varchar(255) NOT NULL,
  `element` varchar(255) default NULL,
  `mapkey` int(11) NOT NULL default '0',
  PRIMARY KEY (`EmpiricallyBasedAlcoholDependenceScale_databaseId`,`mapkey`),
  KEY `FK4B3A3E6B5325EB17` (`EmpiricallyBasedAlcoholDependenceScale_databaseId`),
  CONSTRAINT `FK4B3A3E6B5325EB17` FOREIGN KEY (`EmpiricallyBasedAlcoholDependenceScale_databaseId`) REFERENCES `empiricallybasedalcoholdependencescale`
(`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `empiricallybasedalcoholdependencescale_response`
--

LOCK TABLES `empiricallybasedalcoholdependencescale_response` WRITE;
/*!40000 ALTER TABLE `empiricallybasedalcoholdependencescale_response` DISABLE KEYS */;
INSERT INTO `empiricallybasedalcoholdependencescale_response` VALUES ('ac003dbd-9b62-11dd-a694-001b770639be','SOMETIMES',0),('ac003dbd-9b62-11dd-a694-001b770639be','SOMETIMES',1),('ac003dbd-9b62-11dd-a694-001b770639be','ONCE',2),('ac003dbd-9b62-11dd-a694-001b770639be','YES',3),('ac003dbd-9b62-11dd-a694-001b770639be','SOMETIMES',4),('ac003dbd-9b62-11dd-a694-001b770639be','SOMETIMES',5),('ac003dbd-9b62-11dd-a694-001b770639be','ONCE',6),('ac003dbd-9b62-11dd-a694-001b770639be','YES',7),('ac003dbd-9b62-11dd-a694-001b770639be','ONCE',8),('ac003dbd-9b62-11dd-a694-001b770639be','YES',9),('ac003dbd-9b62-11dd-a694-001b770639be','ONCE_TWICE',10),('ac003dbd-9b62-11dd-a694-001b770639be','BLACKOUT_LESS_THAN_ONE_HOUR',11);
/*!40000 ALTER TABLE `empiricallybasedalcoholdependencescale_response` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `financialinformation`
--

DROP TABLE IF EXISTS `financialinformation`;
CREATE TABLE `financialinformation` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `annualIncome` double default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `financialinformation`
--

LOCK TABLES `financialinformation` WRITE;
/*!40000 ALTER TABLE `financialinformation` DISABLE KEYS */;
INSERT INTO `financialinformation` VALUES ('ac003dc2-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,36500);
/*!40000 ALTER TABLE `financialinformation` ENABLE KEYS */;
UNLOCK TABLES;
```

```
--
-- Table structure for table `geriatricdepressionscaledata`
--
```

```
DROP TABLE IF EXISTS `geriatricdepressionscaledata`;
CREATE TABLE `geriatricdepressionscaledata` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  PRIMARY KEY (`databaseId`)
```

Heuristic Health Resource Referral (H2R2) Engine

```
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `geriatricdepressionscaledata`
--

LOCK TABLES `geriatricdepressionscaledata` WRITE;
/*!40000 ALTER TABLE `geriatricdepressionscaledata` DISABLE KEYS */;
/*!40000 ALTER TABLE `geriatricdepressionscaledata` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `geriatricdepressionscaledata_questionanswerm`
--

DROP TABLE IF EXISTS `geriatricdepressionscaledata_questionanswerm`;
CREATE TABLE `geriatricdepressionscaledata_questionanswerm` (
  `GeriatricDepressionScaleData_databaseId` varchar(255) NOT NULL,
  `element` int(11) default NULL,
  `mapkey` int(11) NOT NULL default '0',
  PRIMARY KEY (`GeriatricDepressionScaleData_databaseId`, `mapkey`),
  KEY `FK65F954C32E856E97` (`GeriatricDepressionScaleData_databaseId`),
  CONSTRAINT `FK65F954C32E856E97` FOREIGN KEY (`GeriatricDepressionScaleData_databaseId`) REFERENCES `geriatricdepressionscaledata` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `geriatricdepressionscaledata_questionanswerm`
--

LOCK TABLES `geriatricdepressionscaledata_questionanswerm` WRITE;
/*!40000 ALTER TABLE `geriatricdepressionscaledata_questionanswerm` DISABLE KEYS */;
/*!40000 ALTER TABLE `geriatricdepressionscaledata_questionanswerm` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `goldbergdepressionscaledata`
--

DROP TABLE IF EXISTS `goldbergdepressionscaledata`;
CREATE TABLE `goldbergdepressionscaledata` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `goldbergdepressionscaledata`
--

LOCK TABLES `goldbergdepressionscaledata` WRITE;
/*!40000 ALTER TABLE `goldbergdepressionscaledata` DISABLE KEYS */;
/*!40000 ALTER TABLE `goldbergdepressionscaledata` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `goldbergdepressionscaledata_questionanswerm`
--

DROP TABLE IF EXISTS `goldbergdepressionscaledata_questionanswerm`;
CREATE TABLE `goldbergdepressionscaledata_questionanswerm` (
  `GoldbergDepressionScaleData_databaseId` varchar(255) NOT NULL,
  `element` varchar(255) default NULL,
  `mapkey` int(11) NOT NULL default '0',
  PRIMARY KEY (`GoldbergDepressionScaleData_databaseId`, `mapkey`),
  KEY `FK9AB3D46F4FD1A3D3` (`GoldbergDepressionScaleData_databaseId`),
  CONSTRAINT `FK9AB3D46F4FD1A3D3` FOREIGN KEY (`GoldbergDepressionScaleData_databaseId`) REFERENCES `goldbergdepressionscaledata` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `goldbergdepressionscaledata_questionanswerm`
--

LOCK TABLES `goldbergdepressionscaledata_questionanswerm` WRITE;
/*!40000 ALTER TABLE `goldbergdepressionscaledata_questionanswerm` DISABLE KEYS */;
/*!40000 ALTER TABLE `goldbergdepressionscaledata_questionanswerm` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `healthresource`
--

DROP TABLE IF EXISTS `healthresource`;
CREATE TABLE `healthresource` (
  `classification` varchar(255) NOT NULL,
  `type` varchar(255) NOT NULL,
  `website` varchar(255) default NULL,
  `databaseId` varchar(255) NOT NULL,
  `address_databaseId` varchar(255) default NULL,
  `emailAddress_databaseId` varchar(255) default NULL,
  `parentAffiliation_databaseId` varchar(255) default NULL,
  `primaryNumber_databaseId` varchar(255) default NULL,
```

Heuristic Health Resource Referral (H2R2) Engine

```
PRIMARY KEY (`databaseId`),
KEY `FK3777DAAAF9C0271F` (`emailAddress_databaseId`),
KEY `FK3777DAAAF155EC3` (`databaseId`),
KEY `FK3777DAAA1129D917` (`primaryNumber_databaseId`),
KEY `FK3777DAAAE61265EB` (`address_databaseId`),
KEY `FK3777DAAAF18C89C` (`parentAffiliation_databaseId`),
CONSTRAINT `FK3777DAAA6F18C89C` FOREIGN KEY (`parentAffiliation_databaseId`) REFERENCES `taxentity` (`databaseId`),
CONSTRAINT `FK3777DAAA1129D917` FOREIGN KEY (`primaryNumber_databaseId`) REFERENCES `phonenum` (`databaseId`),
CONSTRAINT `FK3777DAAA6F155EC3` FOREIGN KEY (`databaseId`) REFERENCES `taxentity` (`databaseId`),
CONSTRAINT `FK3777DAAAE61265EB` FOREIGN KEY (`address_databaseId`) REFERENCES `address` (`databaseId`),
CONSTRAINT `FK3777DAAAF9C0271F` FOREIGN KEY (`emailAddress_databaseId`) REFERENCES `emailaddress` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `healthresource`
--

LOCK TABLES `healthresource` WRITE;
/*!40000 ALTER TABLE `healthresource` DISABLE KEYS */;
INSERT INTO `healthresource` VALUES ('COMMERCIAL','ALCOHOL','www.recoveryaddiction.net','ac3e3125-9b62-11dd-a694-001b770639be','ac3e3126-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a227-9b62-11dd-a694-001b770639be'),('FREE','ALCOHOL','www.aasanjose.org/new_development/',,'ac40a228-9b62-11dd-a694-001b770639be','ac40a229-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a22a-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','alcoholism.about.com/od/tx_ca/qt/gfc_sjose.htm','ac40a22b-9b62-11dd-a694-001b770639be','ac40a22c-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a22d-9b62-11dd-a694-001b770639be'),('COMMERCIAL','ALCOHOL','www.amicushouse.com','ac40a22e-9b62-11dd-a694-001b770639be','ac40a22f-9b62-11dd-a694-001b770639be','ac40a231-9b62-11dd-a694-001b770639be',NULL,'ac40a230-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','www.arhinc.org','ac40a232-9b62-11dd-a694-001b770639be','ac40a233-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a234-9b62-11dd-a694-001b770639be'),('COMMERCIAL','ALCOHOL','www.addictionsearch.com/treatment_facilities/act-consulting-services_2122.html','ac40a235-9b62-11dd-a694-001b770639be','ac40a236-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a237-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','alcoholism.about.com/od/tx_ca/qt/ctrc_sjose.htm','ac40a238-9b62-11dd-a694-001b770639be','ac40a239-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a23a-9b62-11dd-a694-001b770639be'),('COMMERCIAL','ALCOHOL','alcoholism.about.com/od/tx_ca/qt/cvme_sjose.htm','ac40a23b-9b62-11dd-a694-001b770639be','ac40a23c-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a23d-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','','ac40a23e-9b62-11dd-a694-001b770639be','ac40a23f-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a240-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','www.communitysolutions.org/',,'ac40a241-9b62-11dd-a694-001b770639be','ac40a242-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a243-9b62-11dd-a694-001b770639be'),('COMMERCIAL','ALCOHOL','www.supportsystems-homes.com','ac40a244-9b62-11dd-a694-001b770639be','ac40a245-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a246-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','alcoholism.about.com/od/tx_ca/qt/ncrc_palo.htm','ac40a247-9b62-11dd-a694-001b770639be','ac40a248-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a249-9b62-11dd-a694-001b770639be'),('COMMERCIAL','ALCOHOL','','ac40a24a-9b62-11dd-a694-001b770639be','ac40a24b-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a24c-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','www.usnodrugs.com/California/Santa_Clara/Pathway_Society_Inc','ac40a24d-9b62-11dd-a694-001b770639be','ac40a24e-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a24f-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','www.adventgm.com','ac40a250-9b62-11dd-a694-001b770639be','ac40a251-9b62-11dd-a694-001b770639be','ac40a253-9b62-11dd-a694-001b770639be',NULL,'ac40a252-9b62-11dd-a694-001b770639be'),('COMMERCIAL','ALCOHOL','','ac40a254-9b62-11dd-a694-001b770639be','ac40a255-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a256-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','www.ebcrp.org','ac40a257-9b62-11dd-a694-001b770639be','ac40a258-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a259-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','','ac40a25a-9b62-11dd-a694-001b770639be','ac40a25b-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a25c-9b62-11dd-a694-001b770639be'),('SUBSIDIZED','ALCOHOL','www.communitycounseling.org/',,'ac40a25d-9b62-11dd-a694-001b770639be','ac40a25e-9b62-11dd-a694-001b770639be',NULL,NULL,'ac40a25f-9b62-11dd-a694-001b770639be'),('COMMERCIAL','CIGARETTE','www.stopsmokinghypnosiscenter.com','ac40a260-9b62-11dd-a694-001b770639be','ac42ec51-9b62-11dd-a694-001b770639be','ac42ec53-9b62-11dd-a694-001b770639be',NULL,'ac42ec52-9b62-11dd-a694-001b770639be'),('FREE','CIGARETTE','stopsmoking.stanford.edu','ac42ec54-9b62-11dd-a694-001b770639be','ac42ec55-9b62-11dd-a694-001b770639be',NULL,NULL,'ac42ec56-9b62-11dd-a694-001b770639be'),('COMMERCIAL','CIGARETTE','','ac42ec57-9b62-11dd-a694-001b770639be','ac42ec58-9b62-11dd-a694-001b770639be',NULL,NULL,'ac42ec59-9b62-11dd-a694-001b770639be'),('COMMERCIAL','CIGARETTE','www.quitinstantly.com','ac42ec5a-9b62-11dd-a694-001b770639be','ac42ec5b-9b62-11dd-a694-001b770639be','ac42ec5d-9b62-11dd-a694-001b770639be',NULL,'ac42ec5e-9b62-11dd-a694-001b770639be');
/*!40000 ALTER TABLE `healthresource` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `healthresource_associatedsuggestcare`
--

DROP TABLE IF EXISTS `healthresource_associatedsuggestcare`;
CREATE TABLE `healthresource_associatedsuggestcare` (
  `HealthResource_databaseId` varchar(255) NOT NULL,
  `element` varchar(255) default NULL,
  KEY `FK5266EFAA957E8B7` (`HealthResource_databaseId`),
  CONSTRAINT `FK5266EFAA957E8B7` FOREIGN KEY (`HealthResource_databaseId`) REFERENCES `healthresource` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `healthresource_associatedsuggestcare`
--

LOCK TABLES `healthresource_associatedsuggestcare` WRITE;
/*!40000 ALTER TABLE `healthresource_associatedsuggestcare` DISABLE KEYS */;
INSERT INTO `healthresource_associatedsuggestcare` VALUES ('ac3e3125-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac3e3125-9b62-11dd-a694-001b770639be','IN_PATIENT'),('ac40a228-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a228-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a228-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a22b-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a22b-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a22b-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a22b-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a22b-9b62-11dd-a694-001b770639be','IN_PATIENT'),('ac40a22c-9b62-11dd-a694-001b770639be','IN_PATIENT'),('ac40a232-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a232-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a232-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a232-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a232-9b62-11dd-a694-001b770639be','IN_PATIENT'),('ac40a235-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a235-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a235-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a235-9b62-11dd-a694-001b770639be','IN_PATIENT'),('ac40a235-9b62-11dd-a694-001b770639be','PHYSICAL_INTENSIVE_IN_PATIENT'),('ac40a238-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a238-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a238-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a23b-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a23b-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a23b-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a23b-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a23c-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a23c-9b62-11dd-a694-001b770639be','PHYSICAL_INTENSIVE_IN_PATIENT'),('ac40a241-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a241-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a241-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a244-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a244-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a244-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a244-9b62-11dd-a694-001b770639be','IN_PATIENT'),('ac40a244-9b62-11dd-a694-001b770639be','PHYSICAL_INTENSIVE_IN_PATIENT'),('ac40a247-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a247-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a247-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a24a-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a24a-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a24d-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a24d-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a24d-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a24d-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a250-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a250-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a250-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a250-9b62-11dd-a694-001b770639be','IN_PATIENT'),('ac40a250-9b62-11dd-a694-001b770639be','PHYSICAL_INTENSIVE_IN_PATIENT'),('ac40a254-9b62-11dd-a694-001b770639be','IN_PATIENT'),('ac40a257-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a257-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a257-9b62-11dd-
```

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```
a694-001b770639be','OUT_PATIENT'),('ac40a257-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a25a-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a25a-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a25a-9b62-11dd-a694-001b770639be','INTENSIVE_OUT_PATIENT'),('ac40a25a-9b62-11dd-a694-001b770639be','IN_PATIENT'),('ac40a25a-9b62-11dd-a694-001b770639be','PHYSICAL_INTENSIVE_IN_PATIENT'),('ac40a25d-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a25d-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac40a25d-9b62-11dd-a694-001b770639be','OUT_PATIENT'),('ac40a260-9b62-11dd-a694-001b770639be','ADVICE'),('ac40a260-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac42ec54-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac42ec57-9b62-11dd-a694-001b770639be','BRIEF_COUNSELING'),('ac42ec5a-9b62-11dd-a694-001b770639be','ADVICE');
/*40000 ALTER TABLE `healthresource_associatedsuggestcare` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `healthresource_sexspecificservice`
--

DROP TABLE IF EXISTS `healthresource_sexspecificservice`;
CREATE TABLE `healthresource_sexspecificservice` (
  `HealthResource_databaseId` varchar(255) NOT NULL,
  `element` varchar(255) default NULL,
  KEY `FK23988392A957E8B7` (`HealthResource_databaseId`),
  CONSTRAINT `FK23988392A957E8B7` FOREIGN KEY (`HealthResource_databaseId`) REFERENCES `healthresource` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `healthresource_sexspecificservice`
--

LOCK TABLES `healthresource_sexspecificservice` WRITE;
/*40000 ALTER TABLE `healthresource_sexspecificservice` DISABLE KEYS */;
INSERT INTO `healthresource_sexspecificservice` VALUES ('ac40a22b-9b62-11dd-a694-001b770639be','FEMALE'),('ac40a232-9b62-11dd-a694-001b770639be','FEMALE');
/*40000 ALTER TABLE `healthresource_sexspecificservice` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `heighttrend`
--

DROP TABLE IF EXISTS `heighttrend`;
CREATE TABLE `heighttrend` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `heighttrend`
--

LOCK TABLES `heighttrend` WRITE;
/*40000 ALTER TABLE `heighttrend` DISABLE KEYS */;
INSERT INTO `heighttrend` VALUES ('ac003dbf-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0);
/*40000 ALTER TABLE `heighttrend` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `heighttrend_heightmeasurements`
--

DROP TABLE IF EXISTS `heighttrend_heightmeasurements`;
CREATE TABLE `heighttrend_heightmeasurements` (
  `HeightTrend_databaseId` varchar(255) NOT NULL,
  `element` double default NULL,
  `mapkey` datetime NOT NULL default '0000-00-00 00:00:00',
  PRIMARY KEY (`HeightTrend_databaseId`,`mapkey`),
  KEY `FK213419471CE3335E` (`HeightTrend_databaseId`),
  CONSTRAINT `FK213419471CE3335E` FOREIGN KEY (`HeightTrend_databaseId`) REFERENCES `heighttrend` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `heighttrend_heightmeasurements`
--

LOCK TABLES `heighttrend_heightmeasurements` WRITE;
/*40000 ALTER TABLE `heighttrend_heightmeasurements` DISABLE KEYS */;
INSERT INTO `heighttrend_heightmeasurements` VALUES ('ac003dbf-9b62-11dd-a694-001b770639be',34.4,'1994-12-04 00:00:00'),('ac003dbf-9b62-11dd-a694-001b770639be',39.4,'2001-02-14 00:00:00'),('ac003dbf-9b62-11dd-a694-001b770639be',63.3,'2004-12-18 03:05:18'),('ac003dbf-9b62-11dd-a694-001b770639be',46.4,'2006-06-20 00:00:00');
/*40000 ALTER TABLE `heighttrend_heightmeasurements` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `hygeiauser`
--

DROP TABLE IF EXISTS `hygeiauser`;
CREATE TABLE `hygeiauser` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
```

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`nonce` varchar(255) NOT NULL,
`passwordHash` varchar(255) NOT NULL,
`username` varchar(255) NOT NULL,
`contactInformation_databaseId` varchar(255) default NULL,
`identityInformation_databaseId` varchar(255) NOT NULL,
`preferences_databaseId` varchar(255) default NULL,
PRIMARY KEY (`databaseId`),
UNIQUE KEY `username` (`username`),
KEY `FK2C1AD792514A1F59` (`identityInformation_databaseId`),
KEY `FK2C1AD792AC560F1F` (`contactInformation_databaseId`),
KEY `FK2C1AD792A5232939` (`preferences_databaseId`),
CONSTRAINT `FK2C1AD792A5232939` FOREIGN KEY (`preferences_databaseId`) REFERENCES `preferences` (`databaseId`),
CONSTRAINT `FK2C1AD792514A1F59` FOREIGN KEY (`identityInformation_databaseId`) REFERENCES `identityinformation` (`databaseId`),
CONSTRAINT `FK2C1AD792AC560F1F` FOREIGN KEY (`contactInformation_databaseId`) REFERENCES `contactinformation` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `hygeiauser`
--

LOCK TABLES `hygeiauser` WRITE;
/*!40000 ALTER TABLE `hygeiauser` DISABLE KEYS */;
INSERT INTO `hygeiauser` VALUES ('ab911b8-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,-
4ea807e7557d0456cda92a592914449d4f6279f537fe1ac75d,-77a5503f541ffdb0f2c077a038691bc4061bca134b9e0cbad2f15c2af78373c','admin',NULL,'ab911b9-9b62-11dd-a694-
001b770639be','admin','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,-
02:13:18','admin',0,'43dce1cf28dca60047cbe0f293c83fd3969fd8d3d1ff6df63','36d4c6faccba603be7049e2699db2b3c9acdff627d6585e456f0e5339cad6349','r',NULL,'ac003dac-9b62-11dd-
a694-001b770639be','admin','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,-
3ec9776d2b65a7774a69b033b08e551a139c3ff0a7fd7329a9','592bce6c35d52fa0ef01e97d7f7953ce105b400221a97b6ac4ac94fbae3b01b','qa','ac003db0-9b62-11dd-a694-
001b770639be','ac003dc3-9b62-11dd-a694-001b770639be','ac003db8-9b62-11dd-a694-001b770639be','acd456cf-9b62-11dd-a694-001b770639be','John-0-Y3C','2008-10-16
02:13:20','admin','2008-10-16 02:13:20','admin',0,-2707d202d105b94a816ca2acde745e2802365f018227568a0a',-
282fc85085bd17c7db8e63ce2e55166440ce6bb11d90647fcec57910a88e2b9','John-0-Y3C',NULL,'acd456f0-9b62-11dd-a694-001b770639be',NULL),'acd938f2-9b62-11dd-a694-
001b770639be','Jane-0-Y3C','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,'597f325e2c37c4466352e5171391ea0f7644b704d04c8767a8d',-
33b113610b96a3ac66727cb055cad35bd85be9fb6e094de96ce52b94e6020b7','Jane-0-Y3C',NULL,'acd938f3-9b62-11dd-a694-001b770639be',NULL),'acd938f5-9b62-11dd-a694-
001b770639be','John-1-7rA','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,-
1f9e491b54b2ab47e65eeffca38fc1818830b81ef64b6b8db,'79116ac9f961ca835d2413cde650c9b48fb5e18185306ba7b2a70bc5d85552a9','John-1-7rA',NULL,'acd938f6-9b62-11dd-a694-
001b770639be','admin','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,-
67a4fa7624955c11b82f4a03bd05c8ea7376188b8d3b71d407,'2c1163b7ebbf77bed10626a70ec6849780253c6b321ba6b609d64a8c76b0a56cc','Jane-1-7rA',NULL,'acdb82e9-9b62-11dd-
a694-001b770639be',NULL),'acdb82eb-9b62-11dd-a694-001b770639be','John-2-ZiX','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,-
1e3c4939029b335b88ad18eb7f9e662a23d4b826df9ce2b,'2cd2f849431ca0fddb3188234b8a7a68c843f804da8820c1a4bf9f28b478c00c6','John-2-ZiX',NULL,'acdb82ec-9b62-11dd-a694-
001b770639be',NULL),'acddf3ee-9b62-11dd-a694-001b770639be','Jane-2-ZiX','2008-10-16 02:13:20','admin','2008-10-16
02:13:20','admin',0,'5f2e7af3e72a999b474f149aebcde46d4a12278a6bc758ff9d','16eb2405e80ea5d8dd6016f427cbd67657f9e052d7cd81940fde425b7c7f1423a','Jane-2-ZiX',NULL,'acdddf3ef-
9b62-11dd-a694-001b770639be',NULL),'acddf3ff1-9b62-11dd-a694-001b770639be','John-3-tML','2008-10-16 02:13:20','admin','2008-10-16
02:13:20','admin',0,'48bc25b92d1ba20a704a7ad6f656cfe1a59dc318f50489e3c8','7017a3c8d879405dfca785c37cb26401314a8984644bb7dcdece293cb18172ce015','John-3-
tML',NULL,'acddf3f2-9b62-11dd-a694-001b770639be',NULL),'acddf3f4-9b62-11dd-a694-001b770639be','Jane-3-tML','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,-
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Heuristic Health Resource Referral (H2R2) Engine

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-- Table structure for table `hygeiauser_rolespecificinformation`
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```

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DROP TABLE IF EXISTS `hygieauser_rolespecificinformation`;
CREATE TABLE `hygieauser_rolespecificinformation` (
  `HygieaUser_databaseId` varchar(255) NOT NULL,
  `roleInformation_databaseId` varchar(255) NOT NULL,
  `mapkey` int(11) NOT NULL default '0',
  PRIMARY KEY (`HygieaUser_databaseId`,`mapkey`),
  KEY `FK7E319677414E2109` (`HygieaUser_databaseId`),
  KEY `FK7E319677C607FC89` (`roleInformation_databaseId`),
  CONSTRAINT `FK7E319677C607FC89` FOREIGN KEY (`roleInformation_databaseId`) REFERENCES `rolespecificinformation` (`databaseId`),
  CONSTRAINT `FK7E319677414E2109` FOREIGN KEY (`HygieaUser_databaseId`) REFERENCES `hygieauser` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

```

```
--
-- Dumping data for table `hygeiauser_rolespecificinformation`
--
```

[illegible]

Heuristic Health Resource Referral (H2R2) Engine

```
--
DROP TABLE IF EXISTS `identityinformation`;
CREATE TABLE `identityinformation` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `dateOfBirth` datetime NOT NULL,
  `firstName` varchar(255) NOT NULL,
  `lastName` varchar(255) NOT NULL,
  `middleName` varchar(255) default NULL,
  `sex` varchar(255) NOT NULL,
  `ssn` varchar(9) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `identityinformation`
--

LOCK TABLES `identityinformation` WRITE;
/*!40000 ALTER TABLE `identityinformation` DISABLE KEYS */;
INSERT INTO `identityinformation` VALUES ('ab9f11b9-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin','0','1374-12-29
13:24:31','Admin','User',NULL,'MALE','553457829'),('ac03dac-9b62-11dd-a694-001b770639be','r','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin','0','1374-12-29
13:16:11','Nhung','Le,NULL,'FEMALE','123457829'),('ac03dc3-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:20','admin','0','1985-11-08
02:13:18','Chan','Tran','Thi','FEMALE','123521234'),('ad03c3d-9b62-11dd-a694-001b770639be','John-0-Y3C','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0006-05-05
00:00:00','John','Doe,NULL,'MALE,NULL'),('ad938f3-9b62-11dd-a694-001b770639be','Jane-0-Y3C','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0018-05-06
00:00:00','John','Doe,NULL,'MALE,NULL'),('acd938f6-9b62-11dd-a694-001b770639be','John-1-TrA','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0006-05-05
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00:00:00','John','Doe,NULL,'MALE,NULL'),('acd2adf2-9b62-11dd-a694-001b770639be','John-6-lv9','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0006-05-05
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00:00:00','John','Doe,NULL,'MALE,NULL'),('acd51f09-9b62-11dd-a694-001b770639be','John-8-Kwj','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0006-05-05
00:00:00','John','Doe,NULL,'MALE,NULL'),('acd768f3-9b62-11dd-a694-001b770639be','Jane-8-Kwj','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0018-05-06
00:00:00','John','Doe,NULL,'MALE,NULL'),('acd98616-9b62-11dd-a694-001b770639be','John-9-RSo','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0006-05-05
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00:00:00','John','Doe,NULL,'MALE,NULL'),('acd9daf2-9b62-11dd-a694-001b770639be','John-11-HUG','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0006-05-05
00:00:00','John','Doe,NULL,'MALE,NULL'),('acd94b05-9b62-11dd-a694-001b770639be','John-11-HUG','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0018-05-06
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00:00:00','John','Doe,NULL,'MALE,NULL'),('acd94b06-9b62-11dd-a694-001b770639be','John-12-fUX','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0018-05-06
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00:00:00','John','Doe,NULL,'MALE,NULL'),('acd9501-9b62-11dd-a694-001b770639be','Jane-13-HILe','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0018-05-06
00:00:00','John','Doe,NULL,'MALE,NULL'),('acd9504-9b62-11dd-a694-001b770639be','John-14-mTT','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0006-05-05
00:00:00','John','Doe,NULL,'MALE,NULL'),('acd9507-9b62-11dd-a694-001b770639be','Jane-14-mTT','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0','0018-05-06
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```

Heuristic Health Resource Referral (H2R2) Engine

```
000000','John','Doe','NULL','MALE','NULL'),(acf83221-9b62-11dd-a694-001b770639be','Jane-21-K9S','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,'0018-05-06
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000000','Jane','Doe','NULL','FEMALE','NULL'),(ad08d442-9b62-11dd-a694-001b770639be','John-35-qvL','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,'0006-05-05
000000','John','Doe','NULL','MALE','NULL'),(ad08d445-9b62-11dd-a694-001b770639be','Jane-35-qvL','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,'0018-05-06
000000','Jane','Doe','NULL','FEMALE','NULL'),(ad08d448-9b62-11dd-a694-001b770639be','John-36-ypC','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,'0006-05-05
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000000','John','Doe','NULL','MALE','NULL'),(ad197563-9b62-11dd-a694-001b770639be','Jane-48-hrU','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,'0018-05-06
000000','Jane','Doe','NULL','FEMALE','NULL'),(ad197566-9b62-11dd-a694-001b770639be','John-49-WCX','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,'0006-05-05
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000000','Jane','Doe','NULL','FEMALE','NULL');
/*40000 ALTER TABLE `identityinformation` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `identityinformation_accesscontroldata`
--

DROP TABLE IF EXISTS `identityinformation_accesscontroldata`;
CREATE TABLE `identityinformation_accesscontroldata` (
  `IdentityInformation_databaseId` varchar(255) NOT NULL,
  `operatorUsername` varchar(255) default NULL,
  `readable` bit(1) default NULL,
  `writable` bit(1) default NULL,
  KEY `FKD23C1A12514A1F59` (`IdentityInformation_databaseId`),
  CONSTRAINT `FKD23C1A12514A1F59` FOREIGN KEY (`IdentityInformation_databaseId`) REFERENCES `identityinformation` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `identityinformation_accesscontroldata`
--

LOCK TABLES `identityinformation_accesscontroldata` WRITE;
/*40000 ALTER TABLE `identityinformation_accesscontroldata` DISABLE KEYS */;
INSERT INTO `identityinformation_accesscontroldata` VALUES ('abf911b9-9b62-11dd-a694-001b770639be','admin','',),(ac003dac-9b62-11dd-a694-001b770639be','r','',),(ac003dc3-9b62-11dd-a694-001b770639be','qa','',),(acd456f0-9b62-11dd-a694-001b770639be','John-0-Y3C','',),(acd938f3-9b62-11dd-a694-001b770639be','Jane-0-Y3C','',),(acd938f6-9b62-11dd-a694-001b770639be','John-1-7rA','',),(acd882ce-9b62-11dd-a694-001b770639be','John-2-Z1s','',),(acdcd3ef-9b62-11dd-a694-001b770639be','Jane-2-Z1s','',),(acdcd3f2-9b62-11dd-a694-001b770639be','John-3-tML','',),(acdcd3f5-9b62-11dd-a694-001b770639be','Jane-3-tML','',),(ace03ce8-9b62-11dd-a694-001b770639be','John-4-ZGq','',),(ace03ceb-9b62-11dd-a694-001b770639be','Jane-4-ZGq','',),(ace03cee-9b62-11dd-a694-001b770639be','John-5-8m6','',),(ace2adf1-9b62-11dd-a694-001b770639be','Jane-5-8m6','',),(ace2adff-9b62-11dd-a694-001b770639be','John-6-lv9','',),(ace2ad7f-9b62-11dd-a694-001b770639be','Jane-6-lv9','',),(ace51cfa-9b62-11dd-a694-001b770639be','John-7-0Cg','',),(ace51efd-9b62-11dd-a694-001b770639be','Jane-7-0Cg','',),(ace51f00-9b62-11dd-a694-001b770639be','John-8-Kwj','',),(ace768f3-9b62-11dd-a694-001b770639be','Jane-8-Kwj','',),(ace768f6-9b62-11dd-a694-001b770639be','John-9-RSo','',),(ace9d9f9-9b62-11dd-a694-001b770639be','Jane-9-RSo','',),(ace9d9fc-9b62-11dd-a694-001b770639be','John-10-OGX','',),(ace9d9ff-9b62-11dd-a694-001b770639be','Jane-10-OGX','',),(ace9da02-9b62-11dd-a694-001b770639be','John-11-UGI','',),(ace9da05-9b62-11dd-a694-001b770639be','Jane-11-UGI','',),(ace9da08-9b62-11dd-a694-001b770639be','John-12-ROX','',),(ace9da0b-9b62-11dd-a694-001b770639be','Jane-12-ROX','',),(ace9da0e-9b62-11dd-a694-001b770639be','John-13-HLE','',),(ace99501-9b62-11dd-a694-001b770639be','Jane-13-HLE','',),(ace99504-9b62-11dd-a694-001b770639be','John-14-uMT','',),(ace99507-9b62-11dd-a694-001b770639be','Jane-14-uMT','',),(ace9950a-9b62-11dd-a694-001b770639be','John-15-Tab','',),(acf1060d-9b62-11dd-a694-001b770639be','Jane-15-Tab','',),(acf10610-9b62-11dd-a694-001b770639be','John-16-zdu','',),(acf10613-9b62-11dd-a694-001b770639be','Jane-16-zdu','',),(acf35006-9b62-11dd-a694-001b770639be','John-17-zJ9','',),(acf35009-9b62-11dd-a694-001b770639be','Jane-17-zJ9','',),(acf3500c-9b62-11dd-a694-001b770639be','John-18-Dxx','',),(acf3500f-9b62-11dd-a694-001b770639be','Jane-18-Dxx','',),(acf5c112-9b62-11dd-a694-001b770639be','John-19-WPW','',),(acf5c115-9b62-11dd-a694-001b770639be','Jane-19-WPW','',),(acf5c118-9b62-11dd-a694-001b770639be','John-20-wEC','',),(acf5c11b-
```

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```
9b62-11dd-a694-001b770639be','John-20-wEC',''),('acf8321c-9b62-11dd-a694-001b770639be','John-21-K9S',''),('acf83221-9b62-11dd-a694-001b770639be','Jane-21-K9S',''),('acf83224-9b62-11dd-a694-001b770639be','John-22-lwz',''),('acf83227-9b62-11dd-a694-001b770639be','Jane-22-lwz',''),('acfa7c1a-9b62-11dd-a694-001b770639be','John-23-ill',''),('acfa7c1d-9b62-11dd-a694-001b770639be','Jane-23-ill',''),('acfa7c20-9b62-11dd-a694-001b770639be','John-24-4ko',''),('acfa7c23-9b62-11dd-a694-001b770639be','Jane-24-4ko',''),('acfed26-9b62-11dd-a694-001b770639be','John-25-6ge',''),('acfed29-9b62-11dd-a694-001b770639be','Jane-25-6ge',''),('acfed2c-9b62-11dd-a694-001b770639be','John-26-MfK',''),('acfed2f-9b62-11dd-a694-001b770639be','Jane-26-MfK',''),('acff5c32-9b62-11dd-a694-001b770639be','John-27-5gR',''),('acff5c35-9b62-11dd-a694-001b770639be','Jane-27-5gR',''),('acff5c38-9b62-11dd-a694-001b770639be','John-28-CoW',''),('ad01a82b-9b62-11dd-a694-001b770639be','Jane-28-CoW',''),('ad01a82e-9b62-11dd-a694-001b770639be','John-29-7RC',''),('ad01a831-9b62-11dd-a694-001b770639be','Jane-29-7RC',''),('ad01a834-9b62-11dd-a694-001b770639be','John-30-Xy9',''),('ad01937-9b62-11dd-a694-001b770639be','Jane-30-Xy9',''),('ad04193a-9b62-11dd-a694-001b770639be','John-31-4FI',''),('ad04193d-9b62-11dd-a694-001b770639be','Jane-31-4FI',''),('ad041940-9b62-11dd-a694-001b770639be','John-32-2vz',''),('ad066333-9b62-11dd-a694-001b770639be','Jane-32-2vz',''),('ad066336-9b62-11dd-a694-001b770639be','John-33-x2w',''),('ad066339-9b62-11dd-a694-001b770639be','Jane-33-x2w',''),('ad06633c-9b62-11dd-a694-001b770639be','John-34-8cE',''),('ad08d443f-9b62-11dd-a694-001b770639be','Jane-34-8cE',''),('ad08d442-9b62-11dd-a694-001b770639be','John-35-qv1',''),('ad08d445-9b62-11dd-a694-001b770639be','Jane-35-qv1',''),('ad08d448-9b62-11dd-a694-001b770639be','John-36-ypC',''),('ad0b454b-9b62-11dd-a694-001b770639be','Jane-36-ypC',''),('ad0b454c-9b62-11dd-a694-001b770639be','John-37-k1J',''),('ad0b4551-9b62-11dd-a694-001b770639be','Jane-37-k1J',''),('ad0b4554-9b62-11dd-a694-001b770639be','John-38-KEN',''),('ad0d8f47-9b62-11dd-a694-001b770639be','Jane-38-KEN',''),('ad0d8f4a-9b62-11dd-a694-001b770639be','John-39-E1n',''),('ad0d8f4d-9b62-11dd-a694-001b770639be','Jane-39-E1n',''),('ad0d8f50-9b62-11dd-a694-001b770639be','John-40-1T5',''),('ad100053-9b62-11dd-a694-001b770639be','Jane-40-1T5',''),('ad100055-9b62-11dd-a694-001b770639be','John-41-6ta',''),('ad100059-9b62-11dd-a694-001b770639be','Jane-41-6ta',''),('ad127162-9b62-11dd-a694-001b770639be','John-43-Fsl',''),('ad14bb55-9b62-11dd-a694-001b770639be','Jane-43-Fsl',''),('ad14bb58-9b62-11dd-a694-001b770639be','John-44-sWp',''),('ad14bb5b-9b62-11dd-a694-001b770639be','Jane-44-sWp',''),('ad14bb5c-9b62-11dd-a694-001b770639be','John-45-z3j',''),('ad172c61-9b62-11dd-a694-001b770639be','Jane-45-z3j',''),('ad172c64-9b62-11dd-a694-001b770639be','John-46-VX4',''),('ad172c67-9b62-11dd-a694-001b770639be','Jane-46-VX4',''),('ad172c6a-9b62-11dd-a694-001b770639be','John-47-4nl',''),('ad19755d-9b62-11dd-a694-001b770639be','Jane-47-4nl',''),('ad197560-9b62-11dd-a694-001b770639be','John-48-hrU',''),('ad197563-9b62-11dd-a694-001b770639be','Jane-48-hrU',''),('ad197566-9b62-11dd-a694-001b770639be','John-49-WCX',''),('ad197569-9b62-11dd-a694-001b770639be','Jane-49-WCX',''),(*40000 ALTER TABLE `identityinformation_accesscontroldata` ENABLE KEYS *;
UNLOCK TABLES;
```

```
--
-- Table structure for table `individualrolespecificinformation`
--
```

```
DROP TABLE IF EXISTS `individualrolespecificinformation`;
CREATE TABLE `individualrolespecificinformation` (
  `databaseId` varchar(255) NOT NULL,
  `financialInformation_databaseId` varchar(255) default NULL,
  `pchrInformation_databaseId` varchar(255) default NULL,
  PRIMARY KEY (`databaseId`),
  KEY `FK53CED14B4F30ABA0` (`databaseId`),
  KEY `FK53CED14B3A82331` (`financialInformation_databaseId`),
  CONSTRAINT `FK53CED14B3A82331` FOREIGN KEY (`financialInformation_databaseId`) REFERENCES `financialinformation` (`databaseId`),
  CONSTRAINT `FK53CED14B4F30ABA0` FOREIGN KEY (`databaseId`) REFERENCES `rolespecificinformation` (`databaseId`),
  CONSTRAINT `FK53CED14B4C23495E` FOREIGN KEY (`pchrInformation_databaseId`) REFERENCES `pchrinformation` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
```

```
--
-- Dumping data for table `individualrolespecificinformation`
--
```

```
LOCK TABLES `individualrolespecificinformation` WRITE;
/*40000 ALTER TABLE `individualrolespecificinformation` DISABLE KEYS */;
INSERT INTO `individualrolespecificinformation` VALUES ('ac003daf-9b62-11dd-a694-001b770639be','ac003dc2-9b62-11dd-a694-001b770639be','ac003dbc-9b62-11dd-a694-001b770639be'),('acd938f1-9b62-11dd-a694-001b770639be',NULL,NULL),('acd938fa-9b62-11dd-a694-001b770639be',NULL,NULL),('acdb82e7-9b62-11dd-a694-001b770639be',NULL,NULL),('acdb82ea-9b62-11dd-a694-001b770639be',NULL,NULL),('acdb82ed-9b62-11dd-a694-001b770639be',NULL,NULL),('acdddf30-9b62-11dd-a694-001b770639be',NULL,NULL),('acdddf33-9b62-11dd-a694-001b770639be',NULL,NULL),('ace03cec-9b62-11dd-a694-001b770639be',NULL,NULL),('ace03ced-9b62-11dd-a694-001b770639be',NULL,NULL),('ace2adef-9b62-11dd-a694-001b770639be',NULL,NULL),('ace2adf2-9b62-11dd-a694-001b770639be',NULL,NULL),('ace2adf5-9b62-11dd-a694-001b770639be',NULL,NULL),('ace51e8-9b62-11dd-a694-001b770639be',NULL,NULL),('ace51efb-9b62-11dd-a694-001b770639be',NULL,NULL),('ace51efc-9b62-11dd-a694-001b770639be',NULL,NULL),('ace768f1-9b62-11dd-a694-001b770639be',NULL,NULL),('ace768f4-9b62-11dd-a694-001b770639be',NULL,NULL),('ace768f7-9b62-11dd-a694-001b770639be',NULL,NULL),('ace9d9fa-9b62-11dd-a694-001b770639be',NULL,NULL),('ace9d9fd-9b62-11dd-a694-001b770639be',NULL,NULL),('ace9da00-9b62-11dd-a694-001b770639be',NULL,NULL),('acece4b03-9b62-11dd-a694-001b770639be',NULL,NULL),('acece4b06-9b62-11dd-a694-001b770639be',NULL,NULL),('acece4b09-9b62-11dd-a694-001b770639be',NULL,NULL),('acece4b0c-9b62-11dd-a694-001b770639be',NULL,NULL),('acece94ff-9b62-11dd-a694-001b770639be',NULL,NULL),('acece9502-9b62-11dd-a694-001b770639be',NULL,NULL),('acece9505-9b62-11dd-a694-001b770639be',NULL,NULL),('acece9508-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl060b-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl060e-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl0611-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl35004-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl35007-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl3500a-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl3500d-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl5c11-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl5c113-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl5c116-9b62-11dd-a694-001b770639be',NULL,NULL),('acfl5c119-9b62-11dd-a694-001b770639be',NULL,NULL),('ac8321c-9b62-11dd-a694-001b770639be',NULL,NULL),('ac83222-9b62-11dd-a694-001b770639be',NULL,NULL),('ac83225-9b62-11dd-a694-001b770639be',NULL,NULL),('acfa7c18-9b62-11dd-a694-001b770639be',NULL,NULL),('acfa7c1b-9b62-11dd-a694-001b770639be',NULL,NULL),('acfa7c1c-9b62-11dd-a694-001b770639be',NULL,NULL),('acfed27-9b62-11dd-a694-001b770639be',NULL,NULL),('acfed2a-9b62-11dd-a694-001b770639be',NULL,NULL),('acfed2d-9b62-11dd-a694-001b770639be',NULL,NULL),('acff5c30-9b62-11dd-a694-001b770639be',NULL,NULL),('acff5c33-9b62-11dd-a694-001b770639be',NULL,NULL),('acff5c36-9b62-11dd-a694-001b770639be',NULL,NULL),('acff5c39-9b62-11dd-a694-001b770639be',NULL,NULL),('ad01a82e-9b62-11dd-a694-001b770639be',NULL,NULL),('ad01a82f-9b62-11dd-a694-001b770639be',NULL,NULL),('ad01a832-9b62-11dd-a694-001b770639be',NULL,NULL),('ad041935-9b62-11dd-a694-001b770639be',NULL,NULL),('ad041938-9b62-11dd-a694-001b770639be',NULL,NULL),('ad04193b-9b62-11dd-a694-001b770639be',NULL,NULL),('ad066331-9b62-11dd-a694-001b770639be',NULL,NULL),('ad066334-9b62-11dd-a694-001b770639be',NULL,NULL),('ad066337-9b62-11dd-a694-001b770639be',NULL,NULL),('ad06633a-9b62-11dd-a694-001b770639be',NULL,NULL),('ad08d443-9b62-11dd-a694-001b770639be',NULL,NULL),('ad08d446-9b62-11dd-a694-001b770639be',NULL,NULL),('ad0b4549-9b62-11dd-a694-001b770639be',NULL,NULL),('ad0b454c-9b62-11dd-a694-001b770639be',NULL,NULL),('ad0b454f-9b62-11dd-a694-001b770639be',NULL,NULL),('ad0d8f45-9b62-11dd-a694-001b770639be',NULL,NULL),('ad0d8f48-9b62-11dd-a694-001b770639be',NULL,NULL),('ad0d8f4b-9b62-11dd-a694-001b770639be',NULL,NULL),('ad0d8f4e-9b62-11dd-a694-001b770639be',NULL,NULL),('ad100051-9b62-11dd-a694-001b770639be',NULL,NULL),('ad100054-9b62-11dd-a694-001b770639be',NULL,NULL),('ad100057-9b62-11dd-a694-001b770639be',NULL,NULL),('ad12715a-9b62-11dd-a694-001b770639be',NULL,NULL),('ad127160-9b62-11dd-a694-001b770639be',NULL,NULL),('ad127163-9b62-11dd-a694-001b770639be',NULL,NULL),('ad14bb55-9b62-11dd-a694-001b770639be',NULL,NULL),('ad14bb59-9b62-11dd-a694-001b770639be',NULL,NULL),('ad14bb5c-9b62-11dd-a694-001b770639be',NULL,NULL),('ad172c68-9b62-11dd-a694-001b770639be',NULL,NULL),('ad19755b-9b62-11dd-a694-001b770639be',NULL,NULL),('ad19755e-9b62-11dd-a694-001b770639be',NULL,NULL),('ad197561-9b62-11dd-a694-001b770639be',NULL,NULL),('ad197564-9b62-11dd-a694-001b770639be',NULL,NULL),('ad1be667-9b62-11dd-a694-001b770639be',NULL,NULL),('ad1be66a-9b62-11dd-a694-001b770639be',NULL,NULL);
/*40000 ALTER TABLE `individualrolespecificinformation` ENABLE KEYS */;
UNLOCK TABLES;
```

```
--
-- Table structure for table `languageproficiency`
--
```

```
DROP TABLE IF EXISTS `languageproficiency`;
CREATE TABLE `languageproficiency` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
```

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```
`tupleEditedTime` datetime NOT NULL,
`tupleEditor` varchar(255) NOT NULL,
`versionNumber` bigint(20) default NULL,
`canRead` bit(1) default NULL,
`canSpeak` bit(1) default NULL,
`canWrite` bit(1) default NULL,
`isPrimary` bit(1) default NULL,
`supportedIso639Key` varchar(255) default NULL,
PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `languageproficiency`
--

LOCK TABLES `languageproficiency` WRITE;
/*!40000 ALTER TABLE `languageproficiency` DISABLE KEYS */;
INSERT INTO `languageproficiency` VALUES ('ac003db9-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16
02:13:18','admin',0,'','','NULL','en'),('ac003dba-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,'','','NULL','','vi'),('ac003dbb-9b62-11dd-
a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,'','','NULL','es');
/*!40000 ALTER TABLE `languageproficiency` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `pchrinformation`
--

DROP TABLE IF EXISTS `pchrinformation`;
CREATE TABLE `pchrinformation` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `activityInformation_databaseId` varchar(255) default NULL,
  `cghq28Data_databaseId` varchar(255) default NULL,
  `cigaretteDependenceScale_databaseId` varchar(255) default NULL,
  `consumption_databaseId` varchar(255) default NULL,
  `empiricallyBasedAlcoholDependencyScale_databaseId` varchar(255) default NULL,
  `geriatricDepressionScale_databaseId` varchar(255) default NULL,
  `goldbergDepressionScale_databaseId` varchar(255) default NULL,
  `heightTrend_databaseId` varchar(255) default NULL,
  `weightTrend_databaseId` varchar(255) default NULL,
  PRIMARY KEY (`databaseId`),
  KEY `FK961DE2AF508B5478` (`consumption_databaseId`),
  KEY `FK961DE2AF508B5478` (`cghq28Data_databaseId`),
  KEY `FK961DE2AF1FC18BFE` (`activityInformation_databaseId`),
  KEY `FK961DE2AF508B5478` (`empiricallyBasedAlcoholDependencyScale_databaseId`),
  KEY `FK961DE2AF86A08878` (`cigaretteDependenceScale_databaseId`),
  KEY `FK961DE2AF86A08878` (`goldbergDepressionScale_databaseId`),
  KEY `FK961DE2AFB81F9BFE` (`weightTrend_databaseId`),
  KEY `FK961DE2AF1CE3335E` (`heightTrend_databaseId`),
  KEY `FK961DE2AF9AC19C81` (`geriatricDepressionScale_databaseId`),
  CONSTRAINT `FK961DE2AF9AC19C81` FOREIGN KEY (`geriatricDepressionScale_databaseId`) REFERENCES `geriatricdepressionscaledata` (`databaseId`),
  CONSTRAINT `FK961DE2AF1CE3335E` FOREIGN KEY (`heightTrend_databaseId`) REFERENCES `heighttrend` (`databaseId`),
  CONSTRAINT `FK961DE2AF1FC18BFE` FOREIGN KEY (`activityInformation_databaseId`) REFERENCES `activityinformation` (`databaseId`),
  CONSTRAINT `FK961DE2AF508B5478` FOREIGN KEY (`consumption_databaseId`) REFERENCES `consumption` (`databaseId`),
  CONSTRAINT `FK961DE2AF86A08878` FOREIGN KEY (`cigaretteDependenceScale_databaseId`) REFERENCES `cigarettedependencescale12` (`databaseId`),
  CONSTRAINT `FK961DE2AF508B5478` FOREIGN KEY (`empiricallyBasedAlcoholDependencyScale_databaseId`) REFERENCES `empiricallybasedalcoholdependencescale`
(`databaseId`),
  CONSTRAINT `FK961DE2AFA0A61D57` FOREIGN KEY (`cghq28Data_databaseId`) REFERENCES `cghq28data` (`databaseId`),
  CONSTRAINT `FK961DE2AFB81F9BFE` FOREIGN KEY (`weightTrend_databaseId`) REFERENCES `weighttrend` (`databaseId`),
  CONSTRAINT `FK961DE2AFC38FBBD` FOREIGN KEY (`goldbergDepressionScale_databaseId`) REFERENCES `goldbergdepressionscaledata` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `pchrinformation`
--

LOCK TABLES `pchrinformation` WRITE;
/*!40000 ALTER TABLE `pchrinformation` DISABLE KEYS */;
INSERT INTO `pchrinformation` VALUES ('ac003db9-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0,'ac003dc1-9b62-11dd-a694-
001b770639be','NULL','NULL','ac003db9-9b62-11dd-a694-001b770639be','ac003dbd-9b62-11dd-a694-001b770639be','NULL','NULL','ac003dbf-9b62-11dd-a694-001b770639be','ac003dc0-
9b62-11dd-a694-001b770639be');
/*!40000 ALTER TABLE `pchrinformation` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `phonenummer`
--

DROP TABLE IF EXISTS `phonenummer`;
CREATE TABLE `phonenummer` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `areaCode` varchar(255) NOT NULL,
  `isPrimary` bit(1) default NULL,
  `mainNumber` varchar(255) NOT NULL,
  `type` varchar(255) NOT NULL,
```

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```
PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `phonenumnumber`
--

LOCK TABLES `phonenumnumber` WRITE;
/*!40000 ALTER TABLE `phonenumnumber` DISABLE KEYS */;
INSERT INTO `phonenumnumber` VALUES ('ac003db5-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16
02:13:19','admin','0','408','','1234567','MOBILE'),('ac003db6-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16
02:13:18','admin','0','408',NULL,'1237890','HOME'),('ac003db7-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16
02:13:18','admin','0','415',NULL,'1231234','OFFICE'),('ac40a227-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','866','','8946572','OFFICE'),('ac40a22a-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','3748511','OFFICE'),('ac40a22d-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','2876200','OFFICE'),('ac40a230-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','2942277','OFFICE'),('ac40a234-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','2816570','OFFICE'),('ac40a237-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','2489011','OFFICE'),('ac40a23a-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','7925656','OFFICE'),('ac40a23d-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','8855400','OFFICE'),('ac40a240-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','650','','9407250','OFFICE'),('ac40a243-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','8472067','OFFICE'),('ac40a246-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','3709688','OFFICE'),('ac40a249-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','650','','3281441','OFFICE'),('ac40a24c-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','9985191','OFFICE'),('ac40a24f-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','650','','2441834','OFFICE'),('ac40a252-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','2810708','OFFICE'),('ac40a256-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','2945072','OFFICE'),('ac40a259-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','510','','4467100','OFFICE'),('ac40a25c-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','510','','7133204','OFFICE'),('ac40a25f-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','510','','7924964','OFFICE'),('ac42cc52-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','4929569','OFFICE'),('ac42cc56-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','866','','2187848','OFFICE'),('ac42cc59-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','408','','4101708','OFFICE'),('ac42cc5c-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16
02:13:19','admin','0','415','','3107071','OFFICE');
/*!40000 ALTER TABLE `phonenumnumber` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `preferences`
--

DROP TABLE IF EXISTS `preferences`;
CREATE TABLE `preferences` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `preferences`
--

LOCK TABLES `preferences` WRITE;
/*!40000 ALTER TABLE `preferences` DISABLE KEYS */;
INSERT INTO `preferences` VALUES ('ac003db8-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0);
/*!40000 ALTER TABLE `preferences` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `preferences_languageproficiency`
--

DROP TABLE IF EXISTS `preferences_languageproficiency`;
CREATE TABLE `preferences_languageproficiency` (
  `Preferences_databaseId` varchar(255) NOT NULL,
  `languageProficiencies_databaseId` varchar(255) NOT NULL,
  PRIMARY KEY (`Preferences_databaseId`,`languageProficiencies_databaseId`),
  UNIQUE KEY `languageProficiencies_databaseId` (`languageProficiencies_databaseId`),
  KEY `FK5030EDF6CEC22FDB` (`languageProficiencies_databaseId`),
  KEY `FK5030EDF6A5232939` (`Preferences_databaseId`),
  CONSTRAINT `FK5030EDF6A5232939` FOREIGN KEY (`Preferences_databaseId`) REFERENCES `preferences` (`databaseId`),
  CONSTRAINT `FK5030EDF6CEC22FDB` FOREIGN KEY (`languageProficiencies_databaseId`) REFERENCES `languageproficiency` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `preferences_languageproficiency`
--

LOCK TABLES `preferences_languageproficiency` WRITE;
/*!40000 ALTER TABLE `preferences_languageproficiency` DISABLE KEYS */;
INSERT INTO `preferences_languageproficiency` VALUES ('ac003db8-9b62-11dd-a694-001b770639be','ac003db9-9b62-11dd-a694-001b770639be'),('ac003db8-9b62-11dd-a694-
001b770639be','ac003dba-9b62-11dd-a694-001b770639be'),('ac003db8-9b62-11dd-a694-001b770639be','ac003dbb-9b62-11dd-a694-001b770639be');
/*!40000 ALTER TABLE `preferences_languageproficiency` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `receptionistrolespecificinformation`
--
```

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```
DROP TABLE IF EXISTS `receptionistrolespecificinformation`;
CREATE TABLE `receptionistrolespecificinformation` (
  `databaseId` varchar(255) NOT NULL,
  PRIMARY KEY (`databaseId`),
  KEY `FK41946E494F30ABA0` (`databaseId`),
  CONSTRAINT `FK41946E494F30ABA0` FOREIGN KEY (`databaseId`) REFERENCES `rolespecificinformation` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `receptionistrolespecificinformation`
--

LOCK TABLES `receptionistrolespecificinformation` WRITE;
/*!40000 ALTER TABLE `receptionistrolespecificinformation` DISABLE KEYS */;
INSERT INTO `receptionistrolespecificinformation` VALUES ('abfdccaa-9b62-11dd-a694-001b770639be'),('ac003dad-9b62-11dd-a694-001b770639be');
/*!40000 ALTER TABLE `receptionistrolespecificinformation` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `rolespecificinformation`
--

DROP TABLE IF EXISTS `rolespecificinformation`;
CREATE TABLE `rolespecificinformation` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `isPrimary` bit(1) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `rolespecificinformation`
--

LOCK TABLES `rolespecificinformation` WRITE;
/*!40000 ALTER TABLE `rolespecificinformation` DISABLE KEYS */;
INSERT INTO `rolespecificinformation` VALUES ('abfdccaa-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin','0'),('ac003dad-9b62-11dd-a694-001b770639be','i','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin','0'),('ac003daf-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin','0'),('acd938f1-9b62-11dd-a694-001b770639be','John-0-Y3C','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acd938f4-9b62-11dd-a694-001b770639be','Jane-0-Y3C','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acdb82e7-9b62-11dd-a694-001b770639be','John-1-7rA','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acdb82ea-9b62-11dd-a694-001b770639be','Jane-1-7rA','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acdb82ed-9b62-11dd-a694-001b770639be','John-2-Z1x','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acddF3f0-9b62-11dd-a694-001b770639be','Jane-2-Z1x','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acddF3f3-9b62-11dd-a694-001b770639be','John-3-tML','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace03ce9-9b62-11dd-a694-001b770639be','Jane-3-tML','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace03ce9-9b62-11dd-a694-001b770639be','John-4-ZGq','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace03cec-9b62-11dd-a694-001b770639be','Jane-4-ZGq','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace2adef-9b62-11dd-a694-001b770639be','John-5-8m6','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace2adef-9b62-11dd-a694-001b770639be','Jane-5-8m6','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace2adF5-9b62-11dd-a694-001b770639be','John-6-lv9','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace51ef8-9b62-11dd-a694-001b770639be','Jane-6-lv9','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace51efb-9b62-11dd-a694-001b770639be','John-7-0Cg','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace51efe-9b62-11dd-a694-001b770639be','Jane-7-0Cg','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace768f1-9b62-11dd-a694-001b770639be','John-8-Kwj','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace768f4-9b62-11dd-a694-001b770639be','Jane-8-Kwj','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace768f7-9b62-11dd-a694-001b770639be','John-9-RSo','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace9d9fa-9b62-11dd-a694-001b770639be','Jane-9-RSo','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace9d9fd-9b62-11dd-a694-001b770639be','John-10-OGX','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ace9da00-9b62-11dd-a694-001b770639be','Jane-10-OGX','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acece4b03-9b62-11dd-a694-001b770639be','John-11-UG','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acece4b06-9b62-11dd-a694-001b770639be','Jane-11-UG','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acece4b09-9b62-11dd-a694-001b770639be','John-12-fUX','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acece4b0c-9b62-11dd-a694-001b770639be','Jane-12-fUX','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acece94ff-9b62-11dd-a694-001b770639be','John-13-HLE','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acece9502-9b62-11dd-a694-001b770639be','Jane-13-HLE','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acece9505-9b62-11dd-a694-001b770639be','John-14-uMT','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acece9508-9b62-11dd-a694-001b770639be','Jane-14-uMT','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf1060b-9b62-11dd-a694-001b770639be','John-15-Tab','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf1060c-9b62-11dd-a694-001b770639be','Jane-15-Tab','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf10611-9b62-11dd-a694-001b770639be','John-16-zdu','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf35007-9b62-11dd-a694-001b770639be','John-17-zj9','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf3500a-9b62-11dd-a694-001b770639be','Jane-17-zj9','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf3500d-9b62-11dd-a694-001b770639be','John-18-Dxx','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf5c110-9b62-11dd-a694-001b770639be','Jane-18-Dxx','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf5c113-9b62-11dd-a694-001b770639be','John-19-WPW','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf5c116-9b62-11dd-a694-001b770639be','Jane-19-WPW','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf5c119-9b62-11dd-a694-001b770639be','John-20-wEC','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf8321c-9b62-11dd-a694-001b770639be','John-21-K9S','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf83222-9b62-11dd-a694-001b770639be','Jane-21-K9S','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acf83225-9b62-11dd-a694-001b770639be','John-22-lwz','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acfa7c18-9b62-11dd-a694-001b770639be','Jane-22-lwz','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acfa7c1b-9b62-11dd-a694-001b770639be','John-23-i11','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acfa7c1e-9b62-11dd-a694-001b770639be','Jane-23-i11','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acfa7c21-9b62-11dd-a694-001b770639be','John-24-ko','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acfcfed27-9b62-11dd-a694-001b770639be','John-25-6ge','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acfcfed2a-9b62-11dd-a694-001b770639be','Jane-25-6ge','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acfcfed2d-9b62-11dd-a694-001b770639be','John-26-MfK','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acff5e30-9b62-11dd-a694-001b770639be','Jane-26-MfK','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acff5e33-9b62-11dd-a694-001b770639be','John-27-5gR','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acff5e36-9b62-11dd-a694-001b770639be','Jane-27-5gR','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('acff5e39-9b62-11dd-a694-001b770639be','John-28-CoW','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad01a82c-9b62-11dd-a694-001b770639be','Jane-28-CoW','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad01a82f-9b62-11dd-a694-001b770639be','John-29-TRC','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad01a832-9b62-11dd-a694-001b770639be','Jane-29-TRC','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad01a935-9b62-11dd-a694-001b770639be','John-30-Xy9','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad01a938-9b62-11dd-a694-001b770639be','Jane-30-Xy9','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad01a93b-9b62-11dd-a694-001b770639be','John-31-4FT','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad01a93c-9b62-11dd-a694-001b770639be','Jane-31-4FT','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad066331-9b62-11dd-a694-001b770639be','John-32-2vz','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad066334-9b62-11dd-a694-001b770639be','Jane-32-2vz','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad066337-9b62-11dd-a694-001b770639be','John-33-x2w','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad06633a-9b62-11dd-a694-001b770639be','Jane-33-x2w','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad08d43d-9b62-11dd-a694-001b770639be','John-34-8eE','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad08d440-9b62-11dd-a694-001b770639be','Jane-34-8eE','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad08d443-9b62-11dd-a694-001b770639be','John-35-qvL','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad08d446-9b62-11dd-a694-001b770639be','Jane-35-qvL','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad0b4549-9b62-11dd-a694-001b770639be','John-36-ypC','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad0b454c-9b62-11dd-a694-001b770639be','Jane-36-ypC','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad0b454f-9b62-11dd-a694-001b770639be','John-37-kIJ','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad0b4552-9b62-11dd-a694-001b770639be','Jane-37-kIJ','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad0d8f45-9b62-11dd-a694-001b770639be','John-38-KEN','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad0d8f48-9b62-11dd-a694-001b770639be','Jane-38-KEN','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad0d8f4b-9b62-11dd-a694-001b770639be','John-39-E1n','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin','0'),('ad0d8f4e-
```


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```
9b62-11dd-a694-001b770639be','Jane-39-E1n','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad100051-9b62-11dd-a694-001b770639be','John-40-T15','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad100054-9b62-11dd-a694-001b770639be','Jane-40-T15','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad100057-9b62-11dd-a694-001b770639be','John-41-6ta','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad12715a-9b62-11dd-a694-001b770639be','Jane-41-6ta','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad12715d-9b62-11dd-a694-001b770639be','John-42-JWz','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad127160-9b62-11dd-a694-001b770639be','Jane-42-JWz','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad127163-9b62-11dd-a694-001b770639be','John-43-Fsl','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad14bb56-9b62-11dd-a694-001b770639be','Jane-43-Fsl','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad14bb59-9b62-11dd-a694-001b770639be','John-44-sWp','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad14bb5c-9b62-11dd-a694-001b770639be','Jane-44-sWp','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad172c5f-9b62-11dd-a694-001b770639be','John-45-z3j','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad172c62-9b62-11dd-a694-001b770639be','Jane-45-z3j','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad172c65-9b62-11dd-a694-001b770639be','John-46-VX4','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad172c68-9b62-11dd-a694-001b770639be','Jane-46-VX4','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad19755b-9b62-11dd-a694-001b770639be','John-47-4nl','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad19755c-9b62-11dd-a694-001b770639be','Jane-47-4nl','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad197561-9b62-11dd-a694-001b770639be','John-48-hrU','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad197564-9b62-11dd-a694-001b770639be','Jane-48-hrU','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,''),('ad197567-9b62-11dd-a694-001b770639be','John-49-WCX','2008-10-16 02:13:20','admin','2008-10-16 02:13:20','admin',0,'');
/*40000 ALTER TABLE `rolespecificinformation` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `taxentity`
--

DROP TABLE IF EXISTS `taxentity`;
CREATE TABLE `taxentity` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `cin` varchar(255) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `taxentity`
--

LOCK TABLES `taxentity` WRITE;
/*40000 ALTER TABLE `taxentity` DISABLE KEYS */;
INSERT INTO `taxentity` VALUES ('ac3e3125-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a228-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a22b-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a22c-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a235-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a238-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a23b-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a241-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a242-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a243-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a244-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a247-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a24a-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a24b-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a24c-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a250-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a254-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a257-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a25a-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a25d-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac40a260-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac42cc54-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL),('ac42cc5a-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:19','admin','2008-10-16 02:13:19','admin',0,NULL);
/*40000 ALTER TABLE `taxentity` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `taxentity_localizeddescriptions`
--

DROP TABLE IF EXISTS `taxentity_localizeddescriptions`;
CREATE TABLE `taxentity_localizeddescriptions` (
  `TaxEntity_databaseId` varchar(255) NOT NULL,
  `localized_description_text` varchar(4000) default NULL,
  `mapkey` int(11) NOT NULL default '0',
  PRIMARY KEY (`TaxEntity_databaseId`,`mapkey`),
  KEY `FK425F68E120A5C054` (`TaxEntity_databaseId`),
  CONSTRAINT `FK425F68E120A5C054` FOREIGN KEY (`TaxEntity_databaseId`) REFERENCES `taxentity` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `taxentity_localizeddescriptions`
--

LOCK TABLES `taxentity_localizeddescriptions` WRITE;
/*40000 ALTER TABLE `taxentity_localizeddescriptions` DISABLE KEYS */;
INSERT INTO `taxentity_localizeddescriptions` VALUES ('ac3e3125-9b62-11dd-a694-001b770639be','At New Life Recovery Centers, all Directors, Counselors and Staff have personally experienced the recovery process. We know, first hand, the desperation, loneliness, despair and devastation alcoholism can bring. We also know there is a solution. We desire to offer this solution to you.',0),('ac40a228-9b62-11dd-a694-001b770639be','The Santa Clara County Intergroup Service Council is the local service body of the several hundred Alcoholics Anonymous groups of Santa Clara County, California. This site is maintained by us to provide information regarding the A.A. meetings in our county. A.A. service committee meetings and other Northern California intergroups. Anyone desiring to find general information regarding the AA program of recovery from alcoholism should visit our world-wide General Service Office Web site at aa.org.',0),('ac40a22b-9b62-11dd-a694-001b770639be','Mix of mental health, alcoholism, and substance abuse services.',0),('ac40a22c-9b62-11dd-a694-001b770639be','Amicus House, located in San Jose, California, is an organization that has been dedicated to helping those with drug and alcohol abuse problems since 1989. Working towards a common goal, our highly qualified staff provides guidance, care and treatment in an intensive and caring environment.',0),('ac40a232-9b62-11dd-a694-001b770639be','ARH was established in 1962 and incorporated in 1965 as Halfway House of Santa Clara Valley, Inc. In 1975 the name was changed to Alcoholic Recovery Homes of Santa Clara Valley, Inc., and in 1992 to ARH Recovery Homes, Inc.',0),('ac40a235-9b62-11dd-a694-001b770639be','Services for individuals, groups, and families.',0),('ac40a238-9b62-11dd-a694-001b770639be','Substance abuse treatment service.',0),('ac40a23b-9b62-11dd-a694-001b770639be','Mix of mental health and substance abuse services.',0),('ac40a23c-9b62-11dd-a694-001b770639be','Services for individuals, groups, and families.',0),('ac40a241-9b62-11dd-a694-001b770639be','Community Solutions was founded as a teen drop-in center in 1972. Since that time, we have grown in both depth and breadth of services as a response to the growing and changing needs of our community. We provide a comprehensive spectrum of prevention, intervention, treatment, residential and housing services to the communities of South Santa Clara County, South San Jose and San Benito County. We are governed by a voluntary Board of Directors who live in and represent these communities. We receive support from a diverse funding base including local, state and federal government; private foundations; and contributions.',0),('ac40a244-9b62-11dd-a694-001b770639be','Based on experience with thousands of clients, being a treatment provider since 1990, and data from the treatment field, Support Systems Homes knows that substance abuse treatment does work.',0),('ac40a247-9b62-11dd-a694-001b770639be','Substance abuse treatment
```

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services',0),(ac40a24a-9b62-11dd-a694-001b770639be','Pathway House is a privately-owned, transitional care facility with a\ nseparate men and women\'s program for chemically-dependent adults.\ nIt is licensed by the Minnesota Department of Human Services.',0),(ac40a24d-9b62-11dd-a694-001b770639be','Pathway Society Inc drug treatment center is a treatment facility located in Santa Clara, CA. that an individual can enter in order to treat a drug addiction or alcoholism problem. Through therapy and education at Pathway Society Inc, Individual\'s are rehabilitated using various treatment methods which can enable them to lead a productive life. There are many reasons why a person would need to attend Pathway Society Inc in Santa Clara. A few of the many reasons are: the inability to control their drinking or drug use, alienating their friends and family, legal problems, severe depression and general unhappiness due to excessive drug or alcohol use.',0),(ac40a250-9b62-11dd-a694-001b770639be','About Advent Group Ministries is a team of Christians with a mission of bringing hope, healing, and Christ\'s love to hurting children and their families. We provide personal care through a professional staff of counselors and social workers and an a network of well-trained volunteers\ n\ nOur purpose is to meet the needs of troubled and abused youth and adults through Christian love and therapeutic services.',0),(ac40a254-9b62-11dd-a694-001b770639be','Willow Home drug rehab with a primary focus on Substance abuse treatment and drug rehab. Willow Home specializes in Residential long-term treatment (more than 30 days) Long Term Substance Abuse Treatment and Long Term Drug Rehab Program',0),(ac40a257-9b62-11dd-a694-001b770639be','East Bay Community Recovery Project\'s mission is to support the well being of the community by providing substance abuse, mental health and other health related services.',0),(ac40a25a-9b62-11dd-a694-001b770639be','),(ac40a25d-9b62-11dd-a694-001b770639be','The Community Counseling and Education Center (CCEC) has delivered comprehensive mental health care to adults, adolescents, children, and families since 1970.\ n\ nThe clinic is centrally located and proudly continues the tradition of satisfying the needs of the greater Tri-Cities community.\ n\ nThe frequency, duration, and kind of treatment provided are based on critical need.\ n\ nMany insurance policies cover our professional fees.\ n\ nSliding scale fees are available to all low income clients.\ n\ nOur professional staff are provided by highly qualified, licensed staff members and advanced graduated students. Our licensed staff brings a variety of specialties to CCEC\'s comprehensive mental health program. The disciplines of Psychology and Marriage, Family, and Child Therapy are represented.',0),(ac40a260-9b62-11dd-a694-001b770639be','Hypnotize your mind and kick bad habits at the Stop Smoking Hypnosis Center. Whether you want to modify behavior or overcome phobias, we help with a caring, professional approach. We\'ll stop your bad habits, with stop smoking hypnosis and weight loss hypnosis. Don\'t suffer when hypnotism offers time-tested results. We treat men and women of all ages and children 8 or older.',0),(ac42cc54-9b62-11dd-a694-001b770639be','This program is a part of a smoking cessation study conducted by the Stanford Prevention Research Center (SPRC) at Stanford University Medical School.',0),(ac42cc57-9b62-11dd-a694-001b770639be','Commercial center to stop smoking',0),(ac42cc5a-9b62-11dd-a694-001b770639be','The fact that you are here is a good indication that you want to stop smoking. You will find you can stop smoking in one hour with hypnosis.',0);

```
/*40000 ALTER TABLE `taxentity_localizeddescriptions` ENABLE KEYS */;
UNLOCK TABLES;
```

```
--
-- Table structure for table `taxentity_localizednames`
--

DROP TABLE IF EXISTS `taxentity_localizednames`;
CREATE TABLE `taxentity_localizednames` (
  `TaxEntity_databaseId` varchar(255) NOT NULL,
  `element` varchar(255) default NULL,
  `mapkey` int(11) NOT NULL default '0',
  PRIMARY KEY (`TaxEntity_databaseId`,`mapkey`),
  KEY `FK242DBD9E20A5C054` (`TaxEntity_databaseId`),
  CONSTRAINT `FK242DBD9E20A5C054` FOREIGN KEY (`TaxEntity_databaseId`) REFERENCES `taxentity` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
```

```
--
-- Dumping data for table `taxentity_localizednames`
--
```

```
LOCK TABLES `taxentity_localizednames` WRITE;
/*40000 ALTER TABLE `taxentity_localizednames` DISABLE KEYS */;
INSERT INTO `taxentity_localizednames` VALUES ('ac3e3125-9b62-11dd-a694-001b770639be','New Life Recovery Centers, Inc.',0),(ac40a228-9b62-11dd-a694-001b770639be','Alcoholics Anonymous in Santa Clara County, California',0),(ac40a22b-9b62-11dd-a694-001b770639be','Gardner Family Care Corporation - Womens Wellness Program',0),(ac40a22c-9b62-11dd-a694-001b770639be','Amicus House',0),(ac40a232-9b62-11dd-a694-001b770639be','ARH House On The Hill',0),(ac40a235-9b62-11dd-a694-001b770639be','Act Consulting Services',0),(ac40a238-9b62-11dd-a694-001b770639be','Central Treatment and Recovery Center',0),(ac40a23b-9b62-11dd-a694-001b770639be','Central Valley Methadone Clinic',0),(ac40a23c-9b62-11dd-a694-001b770639be','Chemical Dependency Recovery Center at El Camino Hospital',0),(ac40a241-9b62-11dd-a694-001b770639be','Community Solutions',0),(ac40a244-9b62-11dd-a694-001b770639be','CADS Inc Countywide Alcohol and Drug Services',0),(ac40a247-9b62-11dd-a694-001b770639be','North County Treatment and Recovery Center of Palo Alto CA',0),(ac40a24a-9b62-11dd-a694-001b770639be','Pathway House Inc',0),(ac40a24d-9b62-11dd-a694-001b770639be','Pathway Society Outpatient Center',0),(ac40a250-9b62-11dd-a694-001b770639be','About Advent Group Ministries',0),(ac40a254-9b62-11dd-a694-001b770639be','Willow Home',0),(ac40a257-9b62-11dd-a694-001b770639be','East Bay Community Recovery Project',0),(ac40a25a-9b62-11dd-a694-001b770639be','Carnales Unidos Reformando Adictos',0),(ac40a25d-9b62-11dd-a694-001b770639be','Community Counseling & Education Center',0),(ac40a260-9b62-11dd-a694-001b770639be','Stop Smoking Hypnosis Center',0),(ac42cc54-9b62-11dd-a694-001b770639be','Stanford Prevention Research Center',0),(ac42cc57-9b62-11dd-a694-001b770639be','Last Stop Smoking',0),(ac42cc5a-9b62-11dd-a694-001b770639be','San Francisco Stop Smoking ClinicSan Francisco Stop Smoking Clinic',0);
/*40000 ALTER TABLE `taxentity_localizednames` ENABLE KEYS */;
UNLOCK TABLES;
```

```
--
-- Table structure for table `testuseranswer`
--
```

```
DROP TABLE IF EXISTS `testuseranswer`;
CREATE TABLE `testuseranswer` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  `alcoholResource` varchar(255) default NULL,
  `alcoholSuggestedCare` varchar(255) default NULL,
  `cigaretteResource` varchar(255) default NULL,
  `cigaretteSuggestedCare` varchar(255) default NULL,
  `username` varchar(255) NOT NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;
```

```
--
-- Dumping data for table `testuseranswer`
--
```

```
LOCK TABLES `testuseranswer` WRITE;
/*40000 ALTER TABLE `testuseranswer` DISABLE KEYS */;
INSERT INTO `testuseranswer` VALUES ('ac543f5c-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:22','admin','2008-10-16 02:13:22','admin',0,NULL,NULL,NULL,NULL,'John-0-sV043Q'),('ac543f5d-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:22','admin','2008-10-16 02:13:22','admin',0,NULL,NULL,NULL,NULL,'Jane-0-sV043Q'),('ac543f5e-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:22','admin','2008-10-16 02:13:22','admin',0,NULL,NULL,NULL,NULL,'John-1-xOq7EA'),('ac543f5f-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:22','admin','2008-10-16 02:13:22','admin',0,NULL,NULL,NULL,NULL,'Jane-1-xOq7EA'),('ac543f60-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:22','admin','2008-10-16 02:13:22','admin',0,NULL,NULL,NULL,NULL,'John-2-R5Suqc'),('ac543f61-9b62-11dd-a694-001b770639be','admin','2008-10-16 02:13:22','admin','2008-10-16 02:13:22','admin',0,NULL,NULL,NULL,NULL,'Jane-2-R5Suqc'),('ac543f62-9b62-11dd-a694-001b770639be','admin','2008-10-16 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```

Heuristic Health Resource Referral (H2R2) Engine

[illegible]

```
-- Table structure for table `weighttrend`
```

Heuristic Health Resource Referral (H2R2) Engine

```
--

DROP TABLE IF EXISTS `weighttrend`;
CREATE TABLE `weighttrend` (
  `databaseId` varchar(255) NOT NULL,
  `ownerName` varchar(255) NOT NULL,
  `tupleCreatedTime` datetime NOT NULL,
  `tupleCreator` varchar(255) NOT NULL,
  `tupleEditedTime` datetime NOT NULL,
  `tupleEditor` varchar(255) NOT NULL,
  `versionNumber` bigint(20) default NULL,
  PRIMARY KEY (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `weighttrend`
--

LOCK TABLES `weighttrend` WRITE;
/*!40000 ALTER TABLE `weighttrend` DISABLE KEYS */;
INSERT INTO `weighttrend` VALUES ('ac003dc0-9b62-11dd-a694-001b770639be','qa','2008-10-16 02:13:18','admin','2008-10-16 02:13:18','admin',0);
/*!40000 ALTER TABLE `weighttrend` ENABLE KEYS */;
UNLOCK TABLES;

--
-- Table structure for table `weighttrend_weightmeasurements`
--

DROP TABLE IF EXISTS `weighttrend_weightmeasurements`;
CREATE TABLE `weighttrend_weightmeasurements` (
  `WeightTrend_databaseId` varchar(255) NOT NULL,
  `element` double default NULL,
  `mapkey` datetime NOT NULL default '0000-00-00 00:00:00',
  PRIMARY KEY (`WeightTrend_databaseId`,`mapkey`),
  KEY `FKAFDE6769B81F9BFE` (`WeightTrend_databaseId`),
  CONSTRAINT `FKAFDE6769B81F9BFE` FOREIGN KEY (`WeightTrend_databaseId`) REFERENCES `weighttrend` (`databaseId`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1;

--
-- Dumping data for table `weighttrend_weightmeasurements`
--

LOCK TABLES `weighttrend_weightmeasurements` WRITE;
/*!40000 ALTER TABLE `weighttrend_weightmeasurements` DISABLE KEYS */;
INSERT INTO `weighttrend_weightmeasurements` VALUES ('ac003dc0-9b62-11dd-a694-001b770639be',34.4,'1994-11-04 00:00:00'),('ac003dc0-9b62-11dd-a694-001b770639be',156.3,'2004-12-21 03:05:18'),('ac003dc0-9b62-11dd-a694-001b770639be',156.3,'2004-12-29 23:51:28'),('ac003dc0-9b62-11dd-a694-001b770639be',156.3,'2005-01-01 07:25:18'),('ac003dc0-9b62-11dd-a694-001b770639be',162.3,'2005-01-05 03:06:08'),('ac003dc0-9b62-11dd-a694-001b770639be',160.3,'2005-03-02 04:45:26'),('ac003dc0-9b62-11dd-a694-001b770639be',163.7,'2005-05-02 08:14:06'),('ac003dc0-9b62-11dd-a694-001b770639be',166.3,'2005-05-07 04:45:09'),('ac003dc0-9b62-11dd-a694-001b770639be',176.4,'2005-09-01 03:25:01'),('ac003dc0-9b62-11dd-a694-001b770639be',183.2,'2005-11-06 09:25:31'),('ac003dc0-9b62-11dd-a694-001b770639be',185.2,'2005-12-03 14:47:03'),('ac003dc0-9b62-11dd-a694-001b770639be',182.1,'2006-01-03 14:47:43'),('ac003dc0-9b62-11dd-a694-001b770639be',176.5,'2006-02-03 18:40:53'),('ac003dc0-9b62-11dd-a694-001b770639be',178.7,'2006-02-09 04:47:32'),('ac003dc0-9b62-11dd-a694-001b770639be',179.3,'2006-04-14 13:04:02'),('ac003dc0-9b62-11dd-a694-001b770639be',177.3,'2006-09-22 21:08:29'),('ac003dc0-9b62-11dd-a694-001b770639be',175.3,'2006-09-27 07:18:26'),('ac003dc0-9b62-11dd-a694-001b770639be',173.4,'2006-10-14 02:08:29'),('ac003dc0-9b62-11dd-a694-001b770639be',169.9,'2006-10-22 11:28:49'),('ac003dc0-9b62-11dd-a694-001b770639be',166.4,'2006-11-03 23:41:20'),('ac003dc0-9b62-11dd-a694-001b770639be',171.4,'2006-12-09 04:07:02'),('ac003dc0-9b62-11dd-a694-001b770639be',173.3,'2007-03-18 03:43:42'),('ac003dc0-9b62-11dd-a694-001b770639be',174.9,'2007-05-02 01:58:29'),('ac003dc0-9b62-11dd-a694-001b770639be',175.3,'2007-06-03 13:01:02'),('ac003dc0-9b62-11dd-a694-001b770639be',177.6,'2007-08-05 00:58:09'),('ac003dc0-9b62-11dd-a694-001b770639be',179.9,'2007-10-24 01:02:04'),('ac003dc0-9b62-11dd-a694-001b770639be',176.4,'2007-11-03 02:01:02);
/*!40000 ALTER TABLE `weighttrend_weightmeasurements` ENABLE KEYS */;
UNLOCK TABLES;
/*!40103 SET TIME_ZONE=@OLD_TIME_ZONE */;

/*!40101 SET SQL_MODE=@OLD_SQL_MODE */;
/*!40014 SET FOREIGN_KEY_CHECKS=@OLD_FOREIGN_KEY_CHECKS */;
/*!40014 SET UNIQUE_CHECKS=@OLD_UNIQUE_CHECKS */;
/*!40101 SET CHARACTER_SET_CLIENT=@OLD_CHARACTER_SET_CLIENT */;
/*!40101 SET CHARACTER_SET_RESULTS=@OLD_CHARACTER_SET_RESULTS */;
/*!40101 SET COLLATION_CONNECTION=@OLD_COLLATION_CONNECTION */;
/*!40111 SET SQL_NOTES=@OLD_SQL_NOTES */;

-- Dump completed on 2008-10-16 9:14:38
```

APPENDIX C – THIRD-PARTY DEPENDENCIES

We employ the following external Java libraries in addition to the Tomcat servlet container and database components.

acegi-security-1.0.7.jar	Echo2_WebContainer.jar
antlr-2.7.6.jar	Echo2_WebRender.jar
aopalliance.jar	ejb3-persistence.jar
asm-2.2.3.jar	fuzzyJ110a.jar
asm-attrs.jar	hibernate-annotations.jar
asm-commons-2.2.3.jar	hibernate-commons-annotations.jar
aspectjrt.jar	hibernate-search.jar
aspectjweaver.jar	hibernate-validator.jar
axis.jar	hibernate3.jar
cglib-nodep-2.1_3.jar	jaxrpc.jar
commons-codec-1.3.jar	jcaptcha-all-1.0-RC6.jar
commons-collections-3.2.1.jar	jcommon-1.0.10.jar
commons-discovery-0.2.jar	jfreechart-1.0.6.jar
commons-fileupload-1.0.jar	jta.jar
commons-httpclient-3.1.jar	jug-asl-2.0.0.jar
commons-io-1.3.2.jar	log4j-1.2.15.jar
commons-lang-2.3.jar	lucene-core-2.3.0.jar
commons-logging-1.1.jar	mysql-connector-java-3.1.14-bin.jar
commons-logging-api-1.1.jar	spring-aop.jar
dom4j-1.6.1.jar	spring-beans.jar
echo2consultas.jar	spring-context.jar
Echo2_App.jar	spring-core.jar
Echo2_Chart_App.jar	spring-jdbc.jar
Echo2_Chart_WebContainer.jar	spring-orm.jar
Echo2_Contrib.jar	spring-tx.jar
Echo2_Extras_App.jar	SuperCSV-1.31.jar
Echo2_Extras_WebContainer.jar	tucana-20060720.jar
Echo2_FileTransfer_App.jar	wsdl4j-1.5.1.jar
Echo2_FileTransfer_WebContainer.jar	

APPENDIX D – USER GUIDE

D.1 H2R2E Group

Log into the system with the given two (2) usernames and passwords (for John Doe and Jane Doe). Use the information in the scenarios above to answer the questions presented to you by the computer. Do your best to guess. Once you have finished with the all of the questions the first time, let the researcher know. He or she will provide additional directions.

1. Login with the John Doe username and password provided. The username and password are both case-sensitive.

Username John-99-AA
Password [masked]



2. Enter the person's home address by clicking the "Add Address" button. Then mark it as the primary address using the radio button on the right. Then, save your entry (make sure you choose Primary Address and see "Information saved!" before continuing.

Interface showing address management options:

- Buttons: Add Number, Save
- Buttons: Add Address, Save
- Message: Information saved!
- Form fields: 123 Some street, San Jose, CA, 12345
- Form field: Home
- Buttons: Primary Address, Remove

- Click on Financial Information, enter the person's income (without any commas), and save your entry (make sure you see "Information saved!" before continuing).

The screenshot shows a web interface with a green header bar. Below it, there are two tabs: "Contact Information" and "Financial Information". The "Financial Information" tab is active. Under this tab, there is a label "Annual Income" followed by a text input field containing the value "12345.00". Below the input field, there is a green "Save" button and a red message "Information saved!".

- Click on the Views header and select "Personally-Controlled Health Records".

The screenshot shows a web interface with a green header bar. Below it, there is a "Welcome back John Doe" message and a "Logout" button. To the right, there is a "Views" dropdown menu. The menu is open, showing four options: "Profile", "Personally-Controlled Health Records", and "Health Resources". The "Personally-Controlled Health Records" option is highlighted. Below the menu, there is a green bar with the word "Information" in a yellow box.

- Click on "Routines" header. Then fill out the Consumption information. Save your entry (make sure you see "Information saved!" before continuing. You may click on "(More Information)" to find out more information about the definition of the terms.

The screenshot shows a web interface with a green header bar. Below it, there is a "Welcome back John Doe" message and a "Logout" button. To the left, there is a "Routines" header with two sub-headers: "Activity Information" and "Consumption". The "Consumption" sub-header is active. To the right, there is a "Consumption" form. The form has two input fields: "Approximate number of drinks per week" with the value "1" and "Approximate number of days you binge drink per week" with the value "2". Each input field has a "(More Information)" link next to it. Below the input fields, there is a green "Save" button and a red message "Information saved!".

- Click on "Questionnaires" header and fill out both the Alcohol Dependence Scale and Cigarette Dependence Scale (CDS-12) forms. Save your entry (make sure you see "Information saved!" before continuing).

Heuristic Health Resource Referral (H2R2) Engine

For you, quitting smoking for good would be	<input type="radio"/> Very Difficult <input type="radio"/> Fairly Difficult <input type="radio"/> Fairly Easy <input type="radio"/> Very Easy
After a few hours without smoking, I feel an irresistible urge to smoke	<input type="radio"/> Totally Disagree <input type="radio"/> Somewhat Disagree <input type="radio"/> Neither agree nor disagree <input type="radio"/> Somewhat agree <input type="radio"/> Fully agree
The idea of not having any cigarettes causes me stress	<input type="radio"/> Totally Disagree <input type="radio"/> Somewhat Disagree <input type="radio"/> Neither agree nor disagree <input type="radio"/> Somewhat agree <input type="radio"/> Fully agree
Before going out, I always make sure that I have cigarettes with me	<input type="radio"/> Totally Disagree <input type="radio"/> Somewhat Disagree <input type="radio"/> Neither agree nor disagree <input type="radio"/> Somewhat agree <input type="radio"/> Fully agree
I am a prisoner of cigarettes	<input type="radio"/> Totally Disagree <input type="radio"/> Somewhat Disagree <input type="radio"/> Neither agree nor disagree <input type="radio"/> Somewhat agree <input type="radio"/> Fully agree
I smoke too much	<input type="radio"/> Totally Disagree <input type="radio"/> Somewhat Disagree <input type="radio"/> Neither agree nor disagree <input type="radio"/> Somewhat agree <input type="radio"/> Fully agree
Sometimes I drop everything to go out and buy cigarettes	<input type="radio"/> Totally Disagree <input type="radio"/> Somewhat Disagree <input type="radio"/> Neither agree nor disagree <input type="radio"/> Somewhat agree <input type="radio"/> Fully agree
I smoke all the time	<input type="radio"/> Totally Disagree <input type="radio"/> Somewhat Disagree <input type="radio"/> Neither agree nor disagree <input type="radio"/> Somewhat agree <input type="radio"/> Fully agree
I smoke despite the risks to my health	<input type="radio"/> Totally Disagree <input type="radio"/> Somewhat Disagree <input type="radio"/> Neither agree nor disagree <input type="radio"/> Somewhat agree <input type="radio"/> Fully agree
<input type="button" value="Save"/> Information saved!	

- Then make sure you can see at least 2 health resources in the suggested health resources view by selecting Views, then Health Resources. There should be at least one health resource related to smoking and at least one health resource related to smoking.

 <p>Welcome back, John Doe</p> <p><input type="button" value="Logout"/></p>	<p>Views ▾</p> <p>Profile</p> <p>Personally-Controlled Health Records</p> <p>Health Resources</p>
<p>CADS Inc. Countywide Alcohol and Drug Services 1 West Campbell Avenue, Suite B-43 Campbell, CA 95008 408.370.9688 www.supportsystemsishomes.com</p> <p>Let Stop Smoking 831 Oakle Dr, Apt 47 Campbell, CA 95008-0831 408.410.1708</p>	

- Repeat steps 1 – 7 for the 2nd user (Jane Doe). Note the new username and password.
- Contact the proctor when you are finished.

D.2 Individual Search Group

Use the information in the scenarios above to find web pages for treatment centers that might help each person above. For each person, choose the one best web page that you think will help the person the most and categorize that person. Enter your findings into the “Search Result” button.

You are free to use whatever search engines you deem comfortable with.

1. Click on the “Search Result” button on the front page.



2. Enter the username for the John and Jane Doe users which are provided for you. The usernames are case sensitive.
3. Select the appropriate alcohol and cigarette suggested care and find the best resources for each profile (put the website of the resource). Make sure you see the “Answers saved!” below the Save button before you finish. Do the best you can and leave the values blank if you do not know them.

John Doe	
Username	john-1-abcde
Alcohol Suggested Care	Advice
Alcohol Resource	www.duybaovo.com
Cigarette Suggested Care	Advice
Cigarette Resource	
Jane Doe	
Username	jane-1-abcde
Alcohol Suggested Care	Physical intensive in-patient
Alcohol Resource	www.cs.sjsu.edu
Cigarette Suggested Care	Out-patient
Cigarette Resource	www.psych.sjsu.edu
Answers saved!	

4. Contact the proctor when you are finished.

APPENDIX E – INSTITUTIONAL REVIEW BOARD (IRB) DOCUMENTS

The following documents were submitted prior to conducting the experiments as outlined by SJSU's Office of Graduate Studies and Research's Human Subjects - Institutional Review Board at <http://www.sjsu.edu/gradstudies/irb/>



**San Jose State University
Human Subjects–Institutional Review Board
Request to Use Human Subjects in Research
Cover Sheet**

For Help in (most) fill-in fields, push F1.

Date submitted:	3 October 2008	Project Period: From:	3 October 2008	To:	3 October 2009
Funded by:	Not funded				
Name:	Duy B. Vo		Department:	Computer Science	
Phone Number:	Work:		During:	Home:	
Cell Phone:	408.839.1116	Pager:		E-mail address:	duybvo@gmail.com
Address:	5552 Sunspring Circle, San Jose, CA 95138				
Select one:	<input type="checkbox"/> If Non-SJSU Investigator, SJSU contact:				
Title of proposed project:	Heuristic Health Resource Referral (H2R2) Engine				
Abstract: (If possible, attach on a separate sheet)	Searching for health resources is difficult for many individuals because it requires domain knowledge and understanding of search engines techniques. Our system proposes a paradigm shift whereby users provide as much or as little information as they feel comfortable, and we endeavor to match them with relevant health resources. The system first attempts to identify risk factors through a heuristic engine that employs fuzzy logic and then searches for health resources based on the user's profile. We aim to unburden the user from having to understand complex health information and sometimes esoteric search techniques.				
Number of Subjects:	60		Age of Subjects:	18+	
Type of Subjects:	College students				
Proposed Research Method:	Experimental				
What Kinds of Data Will Be Collected:	Measures of students' ability to locate relevant online health resources for fictitious persons exhibiting characteristics of alcohol or cigarette dependence.				
	Is a copy or description of each data collection instrument attached:				
	Are procedures to protect confidentiality delineated:				

Heuristic Health Resource Referral (H2R2) Engine

	Are agreements from participating institutions (on their letterhead) included:			
	Is a consent form attached:			
	Is it on SJSU letterhead?			
Possible Risks:	Risks are minimal and are no greater than those encountered in using a computer for ~30 minutes			
Category of Risk:		(see categories below)		
A. Research involving only minimal risks to human subjects: Probability and magnitude of harm or discomfort are no greater than they encounter in daily life.				
B. Research involving reasonable risk to human subjects: Risks to the subject are reasonable in relation to anticipated benefits to the subjects and the importance of the knowledge that may reasonably be expected to result				
Please submit two copies of the completed protocol and supporting materials to: HS-IRB Coordinator Graduate Studies & Research San Jose State University San Jose, CA 95192-0025.				
For questions call the HS-IRB Coordinator at (408) 924-2479 .				

Responsible Faculty Member Form		
Must be submitted with all student research protocols.		
Title of proposed project: Heuristic Health Resource Referral (H2R2) Engine		
Student Investigator(s): Duy B. Vo		
Responsible Faculty Member(s): Sean Laraway, Ph.D.		
I (we), the undersigned, have reviewed the above named study and believe the research conforms to federal, state, and SJSU policy for the protection of human subjects in research. Further, I (we) will monitor the course and conduct of the proposed research.		
Faculty Signature(s)	Date 1 October 2008	Department Psychology

Verification of Translation Accuracy		
Title of Proposed Project:		
I, the undersigned, verify that all translated materials related to the above named study reflect the intent and spirit of the English text.		
Signature:	Date:	Phone:
Mailing Address:		

Extension of Time Request Format	
Name:	Department:
Phone: work	home
Address:	
Title of project:	
Reason for request:	
Changes or significant events that have occurred during the approval period:	
Include a copy of the original protocol.	

One Washington Square
San Jose, CA 95128-0055
Voice: 408-924-2427
Fax: 408-924-2813
E-mail: gradstudies@sjcsu.edu
<http://www.sjcsu.edu>

The California State Assembly
 Assembly Office
 Assembly Chamber House, 1000
 Congress Hall, San Francisco
 Folio, 10000, Long Beach
 Los Angeles, Maritime Academy
 Monterey Bay, Monterey, Fresno
 Sacramento, San Bernardino, San Diego,
 San Francisco, San Jose, San Luis Obispo,
 San Marcos, Santa Barbara

APPENDIX F – SOURCE CODE

For brevity and ease of understanding, we only include the most relevant components of our application as it relates to our fuzzy rules. For a complete source listing, please contact *duybo at gmail dot com*.

```
package edu.sjsu.cs.duybaovo.h2r2c.bo;

import hygeia.bo.information.Sex;
import hygeia.bo.information.contact.Address;
import hygeia.bo.information.contact.EmailAddress;
import hygeia.bo.information.contact.PhoneNumber;
import hygeia.bo.organization.TaxEntity;
import hygeia.common.util.bean.HashCodeContributor;
import org.hibernate.annotations.Cascade;
import org.hibernate.annotations.CascadeType;
import org.hibernate.annotations.CollectionOfElements;
import org.hibernate.annotations.NamedQuery;
import org.hibernate.annotations.NamedQueries;
import org.hibernate.search.annotations.Field;
import org.hibernate.search.annotations.Index;
import org.hibernate.search.annotations.Indexed;
import org.hibernate.search.annotations.Store;
import org.hibernate.validator.NotEmpty;
import org.hibernate.validator.NotNull;

import javax.persistence.Entity;
import javax.persistence.EnumType;
import javax.persistence.Enumerated;
import javax.persistence.FetchType;
import javax.persistence.ManyToOne;
import javax.persistence.OneToOne;
import java.util.LinkedHashSet;
import java.util.Set;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Entity
@Indexed
@NamedQueries({
    @NamedQuery(
        name = "retrieveHealthResourceByClassificationSuggestedCareCity",
        query = "FROM HealthResource hr WHERE hr.classification IN (:classification) AND "
            + "hr.address.city = :city AND hr.type = :type"),
    @NamedQuery(
        name = "retrieveHealthResourceByClassificationSuggestedCare",
        query = "FROM HealthResource hr WHERE hr.classification IN (:classification) AND hr.type = :type"),
    @NamedQuery(
        name = "retrieveHealthResourceBySuggestedCareCity",
        query = "FROM HealthResource hr WHERE "
            + "hr.address.city = :city AND hr.type = :type"),
    @NamedQuery(
        name = "retrieveHealthResourceBySuggestedCare",
        query = "FROM HealthResource hr WHERE hr.type = :type")
})
public class HealthResource extends TaxEntity {
    public Address getAddress() {
        return address;
    }

    public void setAddress(final Address address) {
        this.address = address;
    }

    public PhoneNumber getPrimaryNumber() {
        return primaryNumber;
    }

    public void setPrimaryNumber(final PhoneNumber primaryNumber) {
        this.primaryNumber = primaryNumber;
    }

    public String getWebsite() {
        return website;
    }

    public void setWebsite(final String website) {
        this.website = website;
    }

    public CommericalClassification getClassification() {
        return classification;
    }
}
```

Heuristic Health Resource Referral (H2R2) Engine

```
public void setClassification(final CommericalClassification classification) {
    this.classification = classification;
}

public Set<Sex> getSexSpecificService() {
    return sexSpecificService;
}

public void setSexSpecificService(final LinkedHashSet<Sex> sexSpecificService) {
    this.sexSpecificService = sexSpecificService;
}

public TaxEntity getParentAffiliation() {
    return parentAffiliation;
}

public void setParentAffiliation(final TaxEntity parentAffiliation) {
    this.parentAffiliation = parentAffiliation;
}

public EmailAddress getEmailAddress() {
    return emailAddress;
}

public void setEmailAddress(final EmailAddress emailAddress) {
    this.emailAddress = emailAddress;
}

public Set<String> getAssociatedSuggestCare() {
    return associatedSuggestCare;
}

public void setAssociatedSuggestCare(final Set<String> associatedSuggestCare) {
    this.associatedSuggestCare = associatedSuggestCare;
}

public Type getType() {
    return type;
}

public void setType(final Type type) {
    this.type = type;
}

@OneToOne(fetch = FetchType.EAGER)
private Address address;

@OneToOne(fetch = FetchType.EAGER)
private PhoneNumber primaryNumber;

private String website;

@Enumerated(EnumType.STRING)
@NotNull
private Type type;

@Cascade(CascadeType.DELETE_ORPHAN)
@CollectionOfElements(fetch = FetchType.EAGER)
@HashCodeContributor
@NotEmpty
@NotNull
private Set<String> associatedSuggestCare;

@Enumerated(EnumType.STRING)
@Field(index= Index.TOKENIZED, store= Store.NO)
@HashCodeContributor
@NotNull
private CommericalClassification classification;

@Cascade(CascadeType.DELETE_ORPHAN)
@CollectionOfElements(fetch = FetchType.EAGER)
@Enumerated(EnumType.STRING)
@HashCodeContributor
private Set<Sex> sexSpecificService;

@ManyToOne
private TaxEntity parentAffiliation;

@OneToOne(fetch = FetchType.EAGER)
private EmailAddress emailAddress;

public static enum Type {
    ALCOHOL, CIGARETTE,
}

public static enum CommericalClassification {
    FREE, SUBSIDIZED, COMMERCIAL,
}
}
```

```
package hygeia.bo.common;

import hygeia.common.util.bean.HashCodeContributor;
```


Heuristic Health Resource Referral (H2R2) Engine

```
import hygeia.common.util.bean.NonEqualsContributor;
import hygeia.common.util.bean.NonToStringContributor;
import org.apache.commons.lang.builder.EqualsBuilder;
import org.hibernate.search.annotations.DocumentId;
import org.hibernate.validator.NotNull;

import javax.persistence.Id;
import javax.persistence.MappedSuperclass;
import javax.persistence.Temporal;
import javax.persistence.TemporalType;
import javax.persistence.Version;
import java.util.Calendar;

/**
 * @author Duy B. Vo
 */
@MappedSuperclass
public abstract class DatabaseEntity extends BusinessObject {

    protected DatabaseEntity() {
        databaseId = IdGenerator.createId();
    }

    public boolean isSameEntity(final DatabaseEntity other) {
        return EqualsBuilder.reflectionEquals(databaseId, other.databaseId);
    }

    @Override
    public int hashCode() {
        if (databaseId != null) {
            return databaseId.hashCode();
        } else {
            return super.hashCode();
        }
    }

    @Override
    public boolean equals(final Object that) {
        if (that == null) {
            return false;
        } else if (that instanceof DatabaseEntity) {
            final String otherDatabaseId = ((DatabaseEntity)that).databaseId;
            if (databaseId != null && otherDatabaseId != null) {
                return databaseId.equals(otherDatabaseId);
            } else if ((databaseId != null && otherDatabaseId == null) || (databaseId == null && otherDatabaseId != null)) {
                return false;
            } else {
                return super.equals(that);
            }
        } else {
            return false;
        }
    }

    @DocumentId
    public String getDatabaseId() {
        return databaseId;
    }

    public boolean sameEntity(final DatabaseEntity that) {
        return that == null ? false : getDatabaseId() == that.getDatabaseId();
    }

    public String getTupleCreator() {
        return tupleCreator;
    }

    public void setTupleCreator(final String tupleCreator) {
        this.tupleCreator = tupleCreator;
    }

    public Calendar getTupleCreatedTime() {
        return tupleCreatedTime;
    }

    public void setTupleCreatedTime(final Calendar tupleCreatedTime) {
        this.tupleCreatedTime = tupleCreatedTime;
    }

    public String getTupleEditor() {
        return tupleEditor;
    }

    public void setTupleEditor(final String tupleEditor) {
        this.tupleEditor = tupleEditor;
    }

    public Calendar getTupleEditedTime() {
        return tupleEditedTime;
    }

    public void setTupleEditedTime(final Calendar tupleEditedTime) {
        this.tupleEditedTime = tupleEditedTime;
    }

    public Long getVersionNumber() {

```

```
        return versionNumber;
    }

    public void setVersionNumber(final Long versionNumber) {
        this.versionNumber = versionNumber;
    }

    public String getOwnerName() {
        return ownerName;
    }

    public void setOwnerName(final String ownerName) {
        this.ownerName = ownerName;
    }

    @Id
    protected String databaseId;

    @NonEqualsContributor
    @NonToStringContributor
    @NotNull
    private String tupleCreator;

    @NonEqualsContributor
    @NonToStringContributor
    @NotNull
    @Temporal(value = TemporalType.TIMESTAMP)
    private Calendar tupleCreatedTime;

    @NotNull
    private String tupleEditor;

    @NonEqualsContributor
    @NonToStringContributor
    @NotNull
    @Temporal(value = TemporalType.TIMESTAMP)
    private Calendar tupleEditedTime;

    @NonEqualsContributor
    @NonToStringContributor
    @Version
    private Long versionNumber;

    @HashCodeContributor
    @NotNull
    private String ownerName;
}
```

```
package hygeia.bo.common;

import hygeia.common.util.bean.AnnotatedBeanUtil;
import java.io.Serializable;

/**
 * @author Duy B. Vo
 */
public abstract class BusinessObject implements Serializable {

    @Override
    public int hashCode() {
        return AnnotatedBeanUtil.hashCode(this);
    }

    @Override
    public boolean equals(final Object that) {
        return AnnotatedBeanUtil.equals(this, that);
    }

    @Override
    public String toString() {
        return AnnotatedBeanUtil.toString(this);
    }
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.model.dao;

import edu.sjsu.cs.duybaovo.h2r2c.bo.HealthResourceAdministratorRoleInformation;
import hygeia.model.common.dao.AbstractDao;

/**
 * @author Duy B. Vo
 */
public class HealthResourceAdministratorRoleInformationDao
    extends AbstractDao<HealthResourceAdministratorRoleInformation> {
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.model.dao;

import edu.sjsu.cs.duybaovo.h2r2c.bo.HealthResource;
import edu.sjsu.cs.duybaovo.h2r2c.bo.HealthResource.Type;
```

Heuristic Health Resource Referral (H2R2) Engine

```
import hygeia.model.common.dao.AbstractDao;
import org.springframework.stereotype.Repository;
import org.hibernate.Query;

import java.util.LinkedHashSet;
import java.util.List;
import java.util.Set;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Repository
public class HealthResourceDao extends AbstractDao<HealthResource> {

    public <T extends Enum> List<HealthResource> retrieveRelevantResources(
        final Integer offset,
        final Integer limit,
        final String city,
        final Set<HealthResource.CommericalClassification> classifications,
        final Type type,
        final T... suggestedCareTerms) {

        final Query query;

        final boolean hasClassifications = !classifications.isEmpty();
        final boolean hasCity = city != null;
        if (hasCity && hasClassifications) {
            query = getCurrentSession().getNamedQuery(RETRIEVE_RESOURCES_CLASSIFICATION_SUGGESTED_CARE_CITY_QUERY_NAME);
            query.setParameterList(RETRIEVE_RELEVANT_RESOURCES_QUERY_CLASSIFICATION_PARAMETER, classifications);
            query.setString(RETRIEVE_RELEVANT_RESOURCES_QUERY_CITY_PARAMETER, city);
        } else {
            if (hasCity) {
                query = getCurrentSession().getNamedQuery(RETRIEVE_RESOURCES_SUGGESTED_CARE_CITY_QUERY_NAME);
                query.setString(RETRIEVE_RELEVANT_RESOURCES_QUERY_CITY_PARAMETER, city);
            } else if (hasClassifications) {
                query = getCurrentSession().getNamedQuery(RETRIEVE_RESOURCES_CLASSIFICATION_SUGGESTED_CARE_QUERY_NAME);
                query.setParameterList(RETRIEVE_RELEVANT_RESOURCES_QUERY_CLASSIFICATION_PARAMETER, classifications);
            } else {
                query = getCurrentSession().getNamedQuery(RETRIEVE_RESOURCES_SUGGESTED_CARE_QUERY_NAME);
            }
        }

        final Set<String> suggestedCareTermStrings = new LinkedHashSet<String>(suggestedCareTerms.length);
        for (T suggestedCareTerm : suggestedCareTerms) {
            suggestedCareTermStrings.add(suggestedCareTerm.name());
        }

        query.setParameter(RETRIEVE_RELEVANT_RESOURCES_QUERY_TYPE_PARAMETER, type);

        setLimitOffsetForQuery(query, limit, offset);

        return query.list();
    }

    private final static String RETRIEVE_RESOURCES_CLASSIFICATION_SUGGESTED_CARE_CITY_QUERY_NAME =
        "retrieveHealthResourceByClassificationSuggestedCareCity";
    private final static String RETRIEVE_RESOURCES_SUGGESTED_CARE_CITY_QUERY_NAME =
        "retrieveHealthResourceBySuggestedCareCity";
    private final static String RETRIEVE_RESOURCES_SUGGESTED_CARE_QUERY_NAME = "retrieveHealthResourceBySuggestedCare";
    private final static String RETRIEVE_RESOURCES_CLASSIFICATION_SUGGESTED_CARE_QUERY_NAME =
        "retrieveHealthResourceByClassificationSuggestedCare";

    private final static String RETRIEVE_RELEVANT_RESOURCES_QUERY_CITY_PARAMETER = "city";
    private final static String RETRIEVE_RELEVANT_RESOURCES_QUERY_CLASSIFICATION_PARAMETER = "classification";
    private final static String RETRIEVE_RELEVANT_RESOURCES_QUERY_TYPE_PARAMETER = "type";
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.model.dao;

import hygeia.model.common.dao.AbstractDao;
import edu.sjsu.cs.duybaovo.h2r2c.bo.TestUserAnswer;
import org.springframework.stereotype.Repository;
import org.hibernate.criterion.Expression;
import org.hibernate.Criteria;

/**
 * @author Duy B. Vo <dvo@email.sjsu.edu>
 */
@Repository
public class TestUserAnswerDao extends AbstractDao<TestUserAnswer> {

    public TestUserAnswer retrieveTestUser(final String username) {
        final Criteria crit = getCurrentSession().createCriteria(boClass);
        crit.add(Expression.eq("username", username));

        return (TestUserAnswer)crit.uniqueResult();
    }

    @Override
    protected String getOperatorUsername() {
        return "admin";
    }
}
```

```
package hygeia.model.common.dao;

import hygeia.aspect.ApplicationContext;
import hygeia.aspect.security.HygeiaAuthenticationToken;
import hygeia.bo.common.DatabaseEntity;
import hygeia.bo.common.security.AccessControlData;
import hygeia.bo.common.security.AccessControlledDatabaseEntity;
import org.acegisecurity.context.SecurityContextHolder;
import org.hibernate.Criteria;
import org.hibernate.Query;
import org.hibernate.Session;
import org.hibernate.criterion.Expression;

import java.io.Serializable;
import java.security.AccessControlException;
import java.text.MessageFormat;
import java.util.Calendar;
import java.util.LinkedHashSet;
import java.util.List;
import java.util.Set;
import java.util.Map;
import java.util.LinkedHashMap;

/**
 * @author Duy B. Vo
 */
public abstract class AbstractDao<T extends DatabaseEntity> implements Serializable {

    @SuppressWarnings("unchecked")
    protected AbstractDao() {
        /**
         * Get the parameterized database entity with reflection
         * the following string has the form package.name.class<generic.class> and is used to find the parameterized entity
         */
        final String classString = getClass().getGenericSuperclass().toString();
        try {
            boClass = (Class<T>) Class.forName(classString.substring(classString.indexOf("<") + 1, classString.indexOf(">")));
        } catch (ClassNotFoundException e) {
            throw new NoClassDefFoundError("Unable to load Business Object class " + classString + " : " + e.getMessage());
        }

        isAccessControlledEntity = AccessControlledDatabaseEntity.class.isAssignableFrom(boClass);
    }

    protected AbstractDao(final Class<T> boClass) {
        this.boClass = boClass;
        isAccessControlledEntity = AccessControlledDatabaseEntity.class.isAssignableFrom(boClass);
    }

    public void createOrUpdateEntity(final String ownerName, final T entity)
        throws AccessControlException {
        if (isAccessControlledEntity && entity.getVersionNumber() != null) {
            //check to see if write access is available. If no version number, then new entity doesn't need access permission
            boolean writeAccessAllowed = false;
            for (AccessControlData controlData : ((AccessControlledDatabaseEntity) entity).getAccessControlData()) {
                final String controlDataUsername = controlData.getOperatorUsername();
                if (controlDataUsername.equals(getOperatorUsername()) && Boolean.TRUE.equals(controlData.getWritable())) {
                    writeAccessAllowed = true;
                }
            }

            if (!writeAccessAllowed) {
                throw new AccessControlException("Unable to update " + entity + " because no write permission is found");
            }
        }

        setBasicTupleInfo(entity, Calendar.getInstance(), ownerName);

        getCurrentSession().saveOrUpdate(entity);
    }

    protected <E extends DatabaseEntity> void setBasicTupleInfo(
        final E entity, final Calendar now, final String ownerName) {
        if (entity.getVersionNumber() == null) {
            //Set initial values
            entity.setTupleCreatedTime(now);
            entity.setTupleCreator(getOperatorUsername());
            entity.setOwnerName(ownerName);
        }

        //Update modification value
        entity.setTupleEditedTime(now);
        entity.setTupleEditor(getOperatorUsername());
    }

    @SuppressWarnings("unchecked")
    public Set<T> retrieveEntities(final Integer offset, final Integer limit) {
        final Query query = getCurrentSession().createQuery("from " + boClass.getSimpleName() + " entity");
        setLimitOffsetForQuery(query, limit, offset);
        return new LinkedHashSet<T>(query.list());
    }

    protected void setLimitOffsetForQuery(final Query query, final Integer limit, final Integer offset) {
        if (offset != null) {
            query.setFirstResult(offset);
        }
    }
}
```

```
}
if (limit != null) {
    query.setMaxResults(limit);
}
}

@SuppressWarnings("unchecked")
public List<T> retrieveForUser(final String username) {
    if (isAccessControlledEntity) {
        final Query query = buildSelectQuery(username);
        return query.list();
    } else {
        final Criteria crit = buildSelectCriteria(username);
        return crit.list();
    }
}

@SuppressWarnings("unchecked")
public T retrieveEntityForUser(final String username) {
    if (isAccessControlledEntity) {
        final Query query = buildSelectQuery(username);
        return (T) query.uniqueResult();
    } else {
        final Criteria crit = buildSelectCriteria(username);
        return (T) crit.uniqueResult();
    }
}

private Query buildSelectQuery(final String username) {
    final Query query = getCurrentSession().createQuery(
        MessageFormat.format(SELECT_QUERY_WITH_ACCESS_CONTROL, boClass.getSimpleName()));
    query.setParameter(QUERY_PARAMETER_OWNER_NAME, username);
    query.setParameter(QUERY_PARAMETER_OPERATOR_USERNAME, getOperatorUsername());
    return query;
}

private Criteria buildSelectCriteria(final String username) {
    final Criteria crit = getCurrentSession().createCriteria(boClass);
    crit.add(Expression.eq(QUERY_PARAMETER_OWNER_NAME, username));
    return crit;
}

protected Session getCurrentSession() {
    return ApplicationContext.getSessionFactory().getCurrentSession();
}

protected final Class<T> boClass;

/**
 * Helper method to set various fields of the database entity based on a similar set of values. This is useful for
 * setting default time and owner values of cascaded entities.
 *
 * @param entities the entities for which to set the values
 * @param timestamp
 * @param ownerName
 * @param editorName
 */
protected void setDefaultValuesForEntities(
    final Set<? extends DatabaseEntity> entities,
    final Calendar timestamp,
    final String ownerName,
    final String editorName) {
    if (entities == null || entities.isEmpty()) {
        return;
    }
    for (DatabaseEntity info : entities) {
        if (info.getOwnerName() == null) {
            info.setOwnerName(ownerName);
        }
        if (info.getTupleCreatedTime() == null) {
            info.setTupleCreatedTime(timestamp);
        }
        if (info.getTupleCreator() == null) {
            info.setTupleCreator(editorName);
        }
        info.setTupleEditedTime(timestamp);
        info.setTupleEditor(editorName);
    }
}

protected long getCount(final LinkedHashMap<String, ?> criteriaMap) {
    final StringBuilder sqlQuery = new StringBuilder("SELECT count(bo) FROM " + boClass.getSimpleName() + " bo WHERE ");

    String separator = "";
    for (String key : criteriaMap.keySet()) {
        sqlQuery.append(separator).append("bo.").append(key).append(" = :").append(key);
        separator = ", ";
    }

    final Query query = getCurrentSession().createQuery(sqlQuery.toString());

    for (String key : criteriaMap.keySet()) {
        query.setParameter(key, criteriaMap.get(key));
    }

    return (Long)query.uniqueResult();
}
```

Heuristic Health Resource Referral (H2R2) Engine

```
}

protected String getOperatorUsername() {
    return ((HygeiaAuthenticationToken) SecurityContextHolder.getContext().getAuthentication()).getUsername();
}

protected final boolean isAccessControlledEntity;
private static final String QUERY_PARAMETER_OWNER_NAME = "ownerName";
private static final String QUERY_PARAMETER_OPERATOR_USERNAME = "operatorUsername";
private static final String ACCESS_CONTROL_DATA_ATTRIBUTE = "accessControlData";
private static final String ACCESS_CONTROL_DATA_READABLE_ATTRIBUTE = "readable";
private static final String SELECT_QUERY_WITH_ACCESS_CONTROL =
    "SELECT bo from {0} bo JOIN bo." + ACCESS_CONTROL_DATA_ATTRIBUTE + " acd WHERE bo."
    + QUERY_PARAMETER_OWNER_NAME + " = :'" + QUERY_PARAMETER_OWNER_NAME + " AND acd."
    + QUERY_PARAMETER_OPERATOR_USERNAME + " = :'" + QUERY_PARAMETER_OPERATOR_USERNAME + " AND acd."
    + ACCESS_CONTROL_DATA_READABLE_ATTRIBUTE + " = true";
}
```

```
package edu.sjsu.cs.duybaovo.h2r2e.business.engine.exception;
```

```
/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public class H2R2EException extends Exception {
    public H2R2EException(final String message, final Throwable cause) {
        super(message, cause);
    }

    public H2R2EException(final Throwable cause) {
        super(cause);
    }
}
```

```
package edu.sjsu.cs.duybaovo.h2r2e.business.engine.rule;
```

```
import edu.sjsu.cs.duybaovo.h2r2e.business.engine.variable.alcohol.AlcoholSuggestedCareVariable;
import edu.sjsu.cs.duybaovo.h2r2e.business.engine.variable.alcohol.AlcoholRiskVariable;
import edu.sjsu.cs.duybaovo.h2r2e.business.engine.variable.alcohol.AlcoholicConsumptionVariable;
import nrc.fuzzy.FuzzyRule;
import nrc.fuzzy.FuzzyValue;
import nrc.fuzzy.FuzzyValueVector;
import nrc.fuzzy.IncompatibleFuzzyValuesException;
import nrc.fuzzy.IncompatibleRuleInputsException;
import nrc.fuzzy.InvalidFuzzyVariableNameException;
import nrc.fuzzy.InvalidFuzzyVariableTermNameException;
import nrc.fuzzy.InvalidLinguisticExpressionException;
import nrc.fuzzy.InvalidUODRangeException;
import nrc.fuzzy.SingletonFuzzySet;
import nrc.fuzzy.XValueOutsideUODException;
import nrc.fuzzy.XValuesOutOfOrderException;
import org.apache.commons.collections.map.MultiValueMap;

import java.util.Collection;
import java.util.Iterator;
import java.util.LinkedHashSet;
import java.util.Set;

/**
 * @author Duy B. Vo
 */
public class AlcoholicRiskRuleSet {
    public AlcoholicRiskRuleSet(final AlcoholRiskVariable risk, final MultiValueMap fuzzyValues)
        throws InvalidUODRangeException, XValuesOutOfOrderException, InvalidFuzzyVariableNameException,
            XValueOutsideUODException, InvalidFuzzyVariableTermNameException, InvalidLinguisticExpressionException {
        this.risk = risk;

        // Alcohol Consumption
        final Collection consumptionInfo = (Collection) fuzzyValues.get(Factor.ALCOHOLIC_CONSUMPTION);
        if (consumptionInfo != null) {
            final Iterator iterator = consumptionInfo.iterator();
            consumptionVariable = (AlcoholicConsumptionVariable) iterator.next();
            drinksPerWeek = (Integer) iterator.next();
        } else {
            consumptionVariable = null;
            drinksPerWeek = null;
        }

        // Alcoholic
        final Collection adsValues = (Collection) fuzzyValues.get(Factor.ADS);
        if (adsValues != null) {
            final Iterator iterator = adsValues.iterator();
            ads = (AlcoholSuggestedCareVariable) iterator.next();
            adsScore = (Integer) iterator.next();
        } else {
            ads = null;
            adsScore = null;
        }

        rules = buildRuleSet();
    }

    private Set<AlcoholicRiskRule> buildRuleSet()
        throws InvalidUODRangeException, XValuesOutOfOrderException, InvalidFuzzyVariableNameException,
```

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```
XValueOutsideUODException, InvalidFuzzyVariableTermNameException, InvalidLinguisticExpressionException {
final Set<AlcoholicRiskRule> ruleSet = new LinkedHashSet<AlcoholicRiskRule>(20);
AlcoholicRiskRule rule;

if (consumptionVariable != null && ads == null) {
for (AlcoholicConsumptionVariable.Term term : AlcoholicConsumptionVariable.Term.values()) {
rule = buildRuleConsumptionOnly(consumptionVariable, risk, drinksPerWeek, term);
ruleSet.add(rule);
}
}

if (consumptionVariable != null && ads != null) {
rule = buildRuleIfMediumConsumptionAndBriefOrHigherThenHighRisk(consumptionVariable, risk, drinksPerWeek, ads, adsScore);
ruleSet.add(rule);
}

if (ads != null && consumptionVariable == null) {
rule = buildRuleIfOutPatientOrHigherThenHighRisk(ads, risk, adsScore);
ruleSet.add(rule);
rule = buildRuleIfBriefCounselingThenMediumRisk(ads, risk, adsScore);
ruleSet.add(rule);
rule = buildRuleIfAdviceThenLowRisk(ads, risk, adsScore);
ruleSet.add(rule);
}

return ruleSet;
}

private static AlcoholicRiskRule buildRuleConsumptionOnly(
final AlcoholicConsumptionVariable consumption, final AlcoholRiskVariable risk, final int drinksPerWeek,
final AlcoholicConsumptionVariable.Term fuzzyTerm)
throws InvalidLinguisticExpressionException, InvalidUODRangeException, XValuesOutOfOrderException,
InvalidFuzzyVariableNameException, XValueOutsideUODException, InvalidFuzzyVariableTermNameException {
final FuzzyValue consumptionInput = new FuzzyValue(consumption, fuzzyTerm.name());
final int fuzzyTermOrdinal = fuzzyTerm.ordinal();
final FuzzyValue riskValue = new FuzzyValue(risk, AlcoholRiskVariable.Term.values()[fuzzyTermOrdinal].name());
final AlcoholicRiskRule rule = new AlcoholicRiskRule(consumption, null, risk, consumptionInput, null, riskValue);
rule.setDrinksPerWeek(drinksPerWeek);
return rule;
}

private static AlcoholicRiskRule buildRuleIfOutPatientOrHigherThenHighRisk(
final AlcoholSuggestedCareVariable ads, final AlcoholRiskVariable risk, final int adsScore)
throws InvalidLinguisticExpressionException, InvalidUODRangeException, XValuesOutOfOrderException,
InvalidFuzzyVariableNameException, XValueOutsideUODException, InvalidFuzzyVariableTermNameException {
final FuzzyValue adsInput = new FuzzyValue(
ads,
AlcoholSuggestedCareVariable.Term.OUT_PATIENT + " or " + AlcoholSuggestedCareVariable.Term.INTENSIVE_OUT_PATIENT + " or "
+ AlcoholSuggestedCareVariable.Term.IN_PATIENT + " or "
+ AlcoholSuggestedCareVariable.Term.PHYSICAL_INTENSIVE_IN_PATIENT);
final FuzzyValue riskValue = new FuzzyValue(risk, AlcoholRiskVariable.Term.HIGH.name());
final AlcoholicRiskRule rule = new AlcoholicRiskRule(null, ads, risk, null, adsInput, riskValue);
rule.setAdsScore(adsScore);
return rule;
}

private static AlcoholicRiskRule buildRuleIfBriefCounselingThenMediumRisk(
final AlcoholSuggestedCareVariable ads, final AlcoholRiskVariable risk, final int adsScore)
throws InvalidLinguisticExpressionException, InvalidUODRangeException, XValuesOutOfOrderException,
InvalidFuzzyVariableNameException, XValueOutsideUODException, InvalidFuzzyVariableTermNameException {
final FuzzyValue adsInput = new FuzzyValue(ads, AlcoholSuggestedCareVariable.Term.BRIEF_COUNSELING.name());
final FuzzyValue riskValue = new FuzzyValue(risk, AlcoholRiskVariable.Term.MEDIUM.name());
final AlcoholicRiskRule rule = new AlcoholicRiskRule(null, ads, risk, null, adsInput, riskValue);
rule.setAdsScore(adsScore);
return rule;
}

private static AlcoholicRiskRule buildRuleIfAdviceThenLowRisk(
final AlcoholSuggestedCareVariable ads, final AlcoholRiskVariable risk, final int adsScore)
throws InvalidLinguisticExpressionException, InvalidUODRangeException, XValuesOutOfOrderException,
InvalidFuzzyVariableNameException, XValueOutsideUODException, InvalidFuzzyVariableTermNameException {
final FuzzyValue adsInput = new FuzzyValue(ads, AlcoholSuggestedCareVariable.Term.ADVICE.name());
final FuzzyValue riskValue = new FuzzyValue(risk, AlcoholRiskVariable.Term.LOW.name());
final AlcoholicRiskRule rule = new AlcoholicRiskRule(null, ads, risk, null, adsInput, riskValue);
rule.setAdsScore(adsScore);
return rule;
}

private static AlcoholicRiskRule buildRuleIfMediumConsumptionAndBriefOrHigherThenHighRisk(
final AlcoholicConsumptionVariable consumption, final AlcoholRiskVariable risk, final int drinksPerWeek,
final AlcoholSuggestedCareVariable ads, final int adsScore)
throws InvalidLinguisticExpressionException, InvalidUODRangeException, XValuesOutOfOrderException,
InvalidFuzzyVariableNameException, XValueOutsideUODException, InvalidFuzzyVariableTermNameException {
final FuzzyValue consumptionInput = new FuzzyValue(consumption, AlcoholicConsumptionVariable.Term.MEDIUM.name());
final FuzzyValue adsInput = new FuzzyValue(
ads,
AlcoholSuggestedCareVariable.Term.BRIEF_COUNSELING + " or "
+ AlcoholSuggestedCareVariable.Term.OUT_PATIENT + " or " + AlcoholSuggestedCareVariable.Term.INTENSIVE_OUT_PATIENT
+ " or " + AlcoholSuggestedCareVariable.Term.IN_PATIENT + " or "
+ AlcoholSuggestedCareVariable.Term.PHYSICAL_INTENSIVE_IN_PATIENT);
final FuzzyValue riskValue = new FuzzyValue(risk, AlcoholRiskVariable.Term.HIGH.name());
final AlcoholicRiskRule rule =
new AlcoholicRiskRule(consumption, ads, risk, consumptionInput, adsInput, riskValue);
rule.setDrinksPerWeek(drinksPerWeek);
rule.setAdsScore(adsScore);
}
```

```
        return rule;
    }

    public FuzzyValue executeRules()
    throws IncompatibleRuleInputsException, IncompatibleFuzzyValuesException, XValueOutsideUODException {
        FuzzyValue result = null;
        for (AlcoholicRiskRule rule : rules) {
            final FuzzyValueVector values = rule.execute();
            final FuzzyValue output = values.fuzzyValueAt(0);
            if (result == null) {
                result = output;
            } else {
                result = result.fuzzyUnion(output);
            }
        }
        return result;
    }

    public static class AlcoholicRiskRule extends FuzzyRule {
        private AlcoholicRiskRule(
            final AlcoholicConsumptionVariable consumption, final AlcoholSuggestedCareVariable ads,
            final AlcoholRiskVariable risk, final FuzzyValue consumptionInput, final FuzzyValue adsInput,
            final FuzzyValue riskValue)
        throws InvalidUODRangeException, XValuesOutOfOrderException, InvalidFuzzyVariableNameException,
            XValueOutsideUODException, InvalidFuzzyVariableTermNameException {
            this.consumption = consumption;
            this.ads = ads;
            this.risk = risk;
            addConclusion(riskValue);

            this.consumptionInput = consumptionInput;
            if (consumptionInput != null) {
                addAntecedent(consumptionInput);
            }

            this.adsInput = adsInput;
            if (adsInput != null) {
                addAntecedent(adsInput);
            }
        }

        public void setDrinksPerWeek(final int value)
        throws XValuesOutOfOrderException, XValueOutsideUODException {
            if (consumptionInput != null) {
                final FuzzyValue fuzzifiedInput = new FuzzyValue(consumption, new SingletonFuzzySet(value));
                addInput(fuzzifiedInput);
            }
        }

        public void setAdsScore(final int value)
        throws XValuesOutOfOrderException, XValueOutsideUODException {
            if (adsInput != null) {
                final FuzzyValue fuzzifiedInput = new FuzzyValue(ads, new SingletonFuzzySet(value));
                addInput(fuzzifiedInput);
            }
        }

        public AlcoholRiskVariable getRisk() {
            return risk;
        }

        private final AlcoholicConsumptionVariable consumption;
        private final AlcoholSuggestedCareVariable ads;
        private final AlcoholRiskVariable risk;
        private final FuzzyValue consumptionInput;
        private final FuzzyValue adsInput;
    }

    private final AlcoholicConsumptionVariable consumptionVariable;
    private final AlcoholSuggestedCareVariable ads;
    private final AlcoholRiskVariable risk;
    private final Integer drinksPerWeek;
    private final Integer adsScore;
    private final Set<AlcoholicRiskRule> rules;

    public static enum Factor {
        ALCOHOLIC_CONSUMPTION, ADS
    }
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.business.engine.rule;
```

```
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.FuzzyUtil;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.AlcoholSuggestedCareVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.AlcoholicConsumptionVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.BingeDrinkingRiskVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.EmpericallyBasedADSRiskVariable;
import hygeia.bo.information.Sex;
import hygeia.bo.pchr.externalFactor.Consumption;
import hygeia.bo.pchr.questionnaire.EmpericallyBasedAlcoholDependenceScale;
import nrc.fuzzy.FuzzyException;
import nrc.fuzzy.FuzzyRule;
import nrc.fuzzy.FuzzyValue;
import nrc.fuzzy.FuzzyValueVector;
```



```
import nrc.fuzzy.IncompatibleFuzzyValuesException;
import nrc.fuzzy.IncompatibleRuleInputsException;
import nrc.fuzzy.InvalidLIinguisticExpressionException;
import nrc.fuzzy.SingletonFuzzySet;
import nrc.fuzzy.XValueOutsideUODEException;
import nrc.fuzzy.XValuesOutOfOrderException;
import nrc.fuzzy.FuzzyVariable;

import java.util.LinkedHashSet;
import java.util.Set;

/**
 * @author Duy B. Vo
 */
public class AlcoholSuggestedCareRuleSet implements H2R2FuzzyRuleSet {
    public AlcoholSuggestedCareRuleSet(
        final Consumption consumption, final EmpiricallyBasedAlcoholDependenceScale ads, final Sex sex)
        throws FuzzyException {

        this.consumption = consumption;
        this.ads = ads;
        this.sex = sex;

        consumptionVariable = new AlcoholicConsumptionVariable(sex);

        rules = buildRuleSet();
    }

    private Set<AlcoholSuggestedCareRule> buildRuleSet() throws FuzzyException {
        final Set<AlcoholSuggestedCareRule> ruleSet = new LinkedHashSet<AlcoholSuggestedCareRule>(20);

        final boolean hasConsumption = consumption != null;
        final boolean hasDrinksPerWeek = hasConsumption && consumption.getDrinksPerWeek() != null;
        final boolean hasBingeDrink = hasConsumption && consumption.getBingeDrinkPerWeek() != null;

        if (hasConsumption) {
            if (hasDrinksPerWeek) {
                ruleSet.add(consumptionHeavy());
                ruleSet.add(consumptionLight());
                ruleSet.add(consumptionMedium());
            }

            if (hasBingeDrink) {
                ruleSet.add(bingeHigh());
                ruleSet.add(bingeVeryHighRisk());
                ruleSet.add(bingeNoRisk());
            }

            if (hasDrinksPerWeek && hasBingeDrink) {
                ruleSet.add(consumptionMediumANDbingeModerate());
                ruleSet.add(consumptionHeavyANDbingeVeryHigh());
                ruleSet.add(consumptionLightANDbingeNoRiskORModerate());
            }
        }

        final boolean hasADS = ads != null;

        if (hasADS) {
            ruleSet.add(ebadsLowRisk());
            ruleSet.add(ebadsHighRiskORVeryHighRisk());
            ruleSet.add(ebadsModerateRisk());

            if (hasConsumption) {
                if (hasBingeDrink) {
                    ruleSet.add(bingeModerateANDAdsModerate());
                }
            }
        }

        return ruleSet;
    }

    private AlcoholSuggestedCareRule consumptionHeavy() throws FuzzyException {
        final AlcoholicConsumptionVariable consumptionVariable = new AlcoholicConsumptionVariable(sex);
        final FuzzyValue consumptionInput = buildFuzzyValue(consumptionVariable, AlcoholicConsumptionVariable.Term.HEAVY);

        final FuzzyValue conclusionValue = buildFuzzyValue(
            suggestedCareVariable,
            AlcoholSuggestedCareVariable.Term.OUT_PATIENT,
            AlcoholSuggestedCareVariable.Term.INTENSIVE_OUT_PATIENT);

        return new AlcoholSuggestedCareRule(
            consumptionVariable, consumptionInput, null, null, null, null, conclusionValue, consumption, null);
    }

    private AlcoholSuggestedCareRule bingeHigh() throws FuzzyException {
        final FuzzyValue bingeRiskInput = buildFuzzyValue(bingeRiskVariable, BingeDrinkingRiskVariable.Term.HIGH_RISK);

        final FuzzyValue conclusionValue =
            buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.OUT_PATIENT);

        return new AlcoholSuggestedCareRule(
            null, null, bingeRiskVariable, bingeRiskInput, null, null, conclusionValue, consumption, null);
    }

    private AlcoholSuggestedCareRule consumptionMediumANDbingeModerate() throws FuzzyException {
```

Heuristic Health Resource Referral (H2R2) Engine

```
final FuzzyValue consumptionInput = buildFuzzyValue(consumptionVariable, AlcoholicConsumptionVariable.Term.MEDIUM);

final FuzzyValue bingeRiskInput = buildFuzzyValue(bingeRiskVariable, BingeDrinkingRiskVariable.Term.MODERATE_RISK);

final FuzzyValue conclusionValue =
    buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.BRIEF_COUNSELING);

return new AlcoholSuggestedCareRule(
    consumptionVariable,
    consumptionInput,
    bingeRiskVariable,
    bingeRiskInput,
    null,
    null,
    conclusionValue,
    consumption,
    null);
}

private AlcoholSuggestedCareRule consumptionHeavyANDbingeVeryHigh() throws FuzzyException {
    final FuzzyValue consumptionInput = buildFuzzyValue(consumptionVariable, AlcoholicConsumptionVariable.Term.HEAVY);

    final FuzzyValue bingeRiskInput = buildFuzzyValue(bingeRiskVariable, BingeDrinkingRiskVariable.Term.VERY_HIGH_RISK);

    final FuzzyValue conclusionValue = buildFuzzyValue(
        suggestedCareVariable, AlcoholSuggestedCareVariable.Term.PHYSICAL_INTENSIVE_IN_PATIENT);

    return new AlcoholSuggestedCareRule(
        consumptionVariable,
        consumptionInput,
        bingeRiskVariable,
        bingeRiskInput,
        null,
        null,
        conclusionValue,
        consumption,
        null);
}

private AlcoholSuggestedCareRule bingeModerateANDAdsModerate() throws FuzzyException {
    final FuzzyValue bingeRiskInput = buildFuzzyValue(bingeRiskVariable, BingeDrinkingRiskVariable.Term.MODERATE_RISK);

    final FuzzyValue adsRiskInput =
        buildFuzzyValue(adsRiskVariable, EmpiricallyBasedADSRiskVariable.Term.MODERATE_RISK);

    final FuzzyValue conclusionValue =
        buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.OUT_PATIENT);

    return new AlcoholSuggestedCareRule(
        null, null, bingeRiskVariable, bingeRiskInput, adsRiskVariable, adsRiskInput, conclusionValue, consumption, ads);
}

private AlcoholSuggestedCareRule consumptionLightANDBingeNoRiskORModerate() throws FuzzyException {
    final FuzzyValue consumptionInput = buildFuzzyValue(consumptionVariable, AlcoholicConsumptionVariable.Term.LIGHT);

    final FuzzyValue bingeRiskInput = buildFuzzyValue(
        bingeRiskVariable, BingeDrinkingRiskVariable.Term.NO_RISK, BingeDrinkingRiskVariable.Term.MODERATE_RISK);

    final FuzzyValue conclusionValue = buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.ADVISE);

    return new AlcoholSuggestedCareRule(
        consumptionVariable,
        consumptionInput,
        bingeRiskVariable,
        bingeRiskInput,
        null,
        null,
        conclusionValue,
        consumption,
        null);
}

private AlcoholSuggestedCareRule cbadsLowRisk() throws FuzzyException {
    final FuzzyValue adsRiskInput =
        buildFuzzyValue(adsRiskVariable, EmpiricallyBasedADSRiskVariable.Term.LOW_RISK);

    final FuzzyValue conclusionValue =
        buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.ADVISE);

    return new AlcoholSuggestedCareRule(
        null, null, null, null, adsRiskVariable, adsRiskInput, conclusionValue, null, ads);
}

private AlcoholSuggestedCareRule cbadsHighRiskORVeryHighRisk() throws FuzzyException {
    final FuzzyValue adsRiskInput = buildFuzzyValue(
        adsRiskVariable,
        EmpiricallyBasedADSRiskVariable.Term.HIGH_RISK,
        EmpiricallyBasedADSRiskVariable.Term.VERY_HIGH_RISK);

    final FuzzyValue conclusionValue =
        buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.PHYSICAL_INTENSIVE_IN_PATIENT);

    return new AlcoholSuggestedCareRule(
        null, null, null, null, adsRiskVariable, adsRiskInput, conclusionValue, null, ads);
}
```

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```
private AlcoholSuggestedCareRule cbadsModerateRisk() throws FuzzyException {
    final FuzzyValue adsRiskInput =
        buildFuzzyValue(adsRiskVariable, EmpiricallyBasedADSRiskVariable.Term.MODERATE_RISK);

    final FuzzyValue conclusionValue =
        buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.OUT_PATIENT);

    return new AlcoholSuggestedCareRule(
        null, null, null, adsRiskVariable, adsRiskInput, conclusionValue, null, ads);
}

private AlcoholSuggestedCareRule bingeVeryHighRisk() throws FuzzyException {
    final FuzzyValue bingeRiskInput = buildFuzzyValue(bingeRiskVariable, BingeDrinkingRiskVariable.Term.VERY_HIGH_RISK);

    final FuzzyValue conclusionValue =
        buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.OUT_PATIENT);

    return new AlcoholSuggestedCareRule(
        null,
        null,
        bingeRiskVariable,
        bingeRiskInput,
        null,
        null,
        conclusionValue,
        consumption,
        null);
}

private AlcoholSuggestedCareRule consumptionLight() throws FuzzyException {
    final AlcoholicConsumptionVariable consumptionVariable = new AlcoholicConsumptionVariable(sex);
    final FuzzyValue consumptionInput = buildFuzzyValue(consumptionVariable, AlcoholicConsumptionVariable.Term.LIGHT);

    final FuzzyValue conclusionValue = buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.ADVISE);

    return new AlcoholSuggestedCareRule(
        consumptionVariable, consumptionInput, null, null, null, null, conclusionValue, consumption, null);
}

private AlcoholSuggestedCareRule consumptionMedium() throws FuzzyException {
    final AlcoholicConsumptionVariable consumptionVariable = new AlcoholicConsumptionVariable(sex);
    final FuzzyValue consumptionInput = buildFuzzyValue(consumptionVariable, AlcoholicConsumptionVariable.Term.MEDIUM);

    final FuzzyValue conclusionValue =
        buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.BRIEF_COUNSELING);

    return new AlcoholSuggestedCareRule(
        consumptionVariable, consumptionInput, null, null, null, null, conclusionValue, consumption, null);
}

private AlcoholSuggestedCareRule bingeNoRisk() throws FuzzyException {
    final FuzzyValue bingeRiskInput = buildFuzzyValue(bingeRiskVariable, BingeDrinkingRiskVariable.Term.NO_RISK);

    final FuzzyValue conclusionValue =
        buildFuzzyValue(suggestedCareVariable, AlcoholSuggestedCareVariable.Term.ADVISE);

    return new AlcoholSuggestedCareRule(
        null,
        null,
        bingeRiskVariable,
        bingeRiskInput,
        null,
        null,
        conclusionValue,
        consumption,
        null);
}

private static FuzzyValue buildFuzzyValue(final FuzzyVariable fuzzyVariable, final Enum... terms)
    throws InvalidLinguisticExpressionException {
    StringBuilder termStringBuilder = null;
    for (Enum term : terms) {
        if (termStringBuilder == null) {
            termStringBuilder = new StringBuilder();
            termStringBuilder.append(term);
        } else {
            termStringBuilder.append(OR).append(term);
        }
    }

    return new FuzzyValue(fuzzyVariable, termStringBuilder.toString());
}

private FuzzyValue executeRules()
    throws IncompatibleRuleInputsException, IncompatibleFuzzyValuesException, XValueOutsideUODException {
    FuzzyValue result = null;
    for (AlcoholSuggestedCareRule rule : rules) {
        final FuzzyValueVector values = rule.execute();
        final FuzzyValue output = values.fuzzyValueAt(0);
        if (result == null) {
            result = output;
        } else {
            result = result.fuzzySum(output);
        }
    }
}
```

Heuristic Health Resource Referral (H2R2) Engine

```
        return result;
    }

    public AlcoholSuggestedCareVariable.Term getResultFromRuleExecution() throws FuzzyException {
        final FuzzyValue resultFromRules = executeRules();
        final String matchedTermString = FuzzyUtil.getBestMatchedTerm(resultFromRules);
        return matchedTermString == null? null: AlcoholSuggestedCareVariable.Term.valueOf(matchedTermString.toUpperCase());
    }

    private static class AlcoholSuggestedCareRule extends FuzzyRule {
        private AlcoholSuggestedCareRule(
            final AlcoholicConsumptionVariable consumptionVariable,
            final FuzzyValue consumptionInput,
            final BingeDrinkingRiskVariable bingeRiskVariable,
            final FuzzyValue bingeRiskInput,
            final EmpiricallyBasedADSRiskVariable adsRiskVariable,
            final FuzzyValue adsRiskInput,
            final FuzzyValue conclusionValue,
            final Consumption consumption,
            final EmpiricallyBasedAlcoholDependenceScale ads)
            throws FuzzyException {

            if (consumptionInput != null) {
                addAntecedent(consumptionInput);
                createAndAddFuzzyInput(consumptionVariable, (double)consumption.getDrinksPerWeek());
            }

            if (bingeRiskVariable != null) {
                addAntecedent(bingeRiskInput);
                createAndAddFuzzyInput(bingeRiskVariable, (double)consumption.getBingeDrinkPerWeek());
            }

            if (adsRiskInput != null) {
                addAntecedent(adsRiskInput);
                createAndAddFuzzyInput(adsRiskVariable, (double)ads.deriveTotalScore());
            }

            addConclusion(conclusionValue);
        }

        private void createAndAddFuzzyInput(final FuzzyVariable variable, final Double value)
            throws XValuesOutOfOrderException, XValueOutsideUODException {
            final FuzzyValue fuzzifiedInput = new FuzzyValue(variable, new SingletonFuzzySet(value));
            addInput(fuzzifiedInput);
        }
    }

    private final Consumption consumption;
    private final EmpiricallyBasedAlcoholDependenceScale ads;
    private final Sex sex;
    private final Set<AlcoholSuggestedCareRule> rules;
    private final AlcoholSuggestedCareVariable suggestedCareVariable = new AlcoholSuggestedCareVariable();
    private final AlcoholicConsumptionVariable consumptionVariable;
    private final BingeDrinkingRiskVariable bingeRiskVariable = new BingeDrinkingRiskVariable();
    private final EmpiricallyBasedADSRiskVariable adsRiskVariable = new EmpiricallyBasedADSRiskVariable();
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.business.engine.rule;
```

```
/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public interface H2R2EFuzzyRuleSet {

    static final String OR = " OR ";
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol;
```

```
import hygeia.bo.information.Sex;
import nrc.fuzzy.FuzzyValue;
import nrc.fuzzy.FuzzyVariable;
import nrc.fuzzy.InvalidFuzzyVariableNameException;
import nrc.fuzzy.InvalidFuzzyVariableTermNameException;
import nrc.fuzzy.InvalidUODRangeException;
import nrc.fuzzy.LeftLinearFuzzySet;
import nrc.fuzzy.RightLinearFuzzySet;
import nrc.fuzzy.TrapezoidFuzzySet;
import nrc.fuzzy.XValueOutsideUODException;
import nrc.fuzzy.XValuesOutOfOrderException;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.H2R2EFuzzyVariable;

/**
 * Based on number of drinks per week.
 * http://www.drinkingandyou.com/site/uk/biggy.htm
 *
 * @author Duy B. Vo
 */
public class AlcoholicConsumptionVariable extends H2R2EFuzzyVariable<AlcoholicConsumptionVariable.Term> {
    public AlcoholicConsumptionVariable(final Sex sex)
        throws XValuesOutOfOrderException, XValueOutsideUODException, InvalidFuzzyVariableTermNameException,
        InvalidUODRangeException, InvalidFuzzyVariableNameException {
```

Heuristic Health Resource Referral (H2R2) Engine

```
super(AlcoholicConsumptionVariable.class, 0, 168, "drinksPerWeek");
addLightDrinkerType(sex);
addMediumDrinkerType(sex);
addHeavyDrinkerType(sex);
}

public Term[] getFuzzyLinguisticTerms() {
    return Term.values();
}

private FuzzyValue addLightDrinkerType(final Sex sex)
throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
    switch (sex) {
        case MALE:
            return addTerm(Term.LIGHT.name(), new RightLinearFuzzySet(9, 21));
        default:
            return addTerm(Term.LIGHT.name(), new RightLinearFuzzySet(7, 14));
    }
}

private FuzzyValue addMediumDrinkerType(final Sex sex)
throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
    switch (sex) {
        case MALE:
            return addTerm(Term.MEDIUM.name(), new TrapezoidFuzzySet(13, 35, 40, 50));
        default:
            return addTerm(Term.MEDIUM.name(), new TrapezoidFuzzySet(13, 23, 30, 35));
    }
}
```

```
private FuzzyValue addHeavyDrinkerType(final Sex sex)
throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
    switch (sex) {
        case MALE:
            return addTerm(Term.HEAVY.name(), new LeftLinearFuzzySet(34, 55));
        default:
            return addTerm(Term.HEAVY.name(), new LeftLinearFuzzySet(33, 40));
    }
}

public static enum Term {
    LIGHT, MEDIUM, HEAVY
}
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol;
```

```
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.H2R2EFuzzyVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.AlcoholSuggestedCareVariable.Term;
import nrc.fuzzy.FuzzyValue;
import nrc.fuzzy.InvalidFuzzyVariableNameException;
import nrc.fuzzy.InvalidFuzzyVariableTermNameException;
import nrc.fuzzy.InvalidUODRangeException;
import nrc.fuzzy.LeftLinearFuzzySet;
import nrc.fuzzy.RightLinearFuzzySet;
import nrc.fuzzy.TriangleFuzzySet;
import nrc.fuzzy.XValueOutsideUODException;
import nrc.fuzzy.XValuesOutOfOrderException;
```

```
/**
 * http://cib.emcdda.europa.eu/index.cfm?fuseaction=public.Content&nNodeID=3583&sLanguageISO=EN
 *
 * @author Duy B. Vo
 */
public class AlcoholSuggestedCareVariable extends H2R2EFuzzyVariable<Term> {
    public AlcoholSuggestedCareVariable()
        throws XValuesOutOfOrderException, XValueOutsideUODException, InvalidFuzzyVariableTermNameException,
            InvalidUODRangeException, InvalidFuzzyVariableNameException {
        super(AlcoholSuggestedCareVariable.class, 0, 47, null);
        addAdvice();
        addBriefCounseling();
        addOutPatient();
        addIntensiveOutPatient();
        addInpatient();
        addPhysicalIntensiveInpatient();
    }

    private FuzzyValue addAdvice()
        throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.ADVICE.name(), new RightLinearFuzzySet(0, 1));
    }

    private FuzzyValue addBriefCounseling()
        throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.BRIEF_COUNSELING.name(), new TriangleFuzzySet(1, 8, 15));
    }

    private FuzzyValue addOutPatient()
        throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.OUT_PATIENT.name(), new TriangleFuzzySet(13, 18, 21));
    }
}
```

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```
private FuzzyValue addIntensiveOutPatient()
throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
    return addTerm(Term.INTENSIVE_OUT_PATIENT.name(), new TriangleFuzzySet(20, 23, 25));
}

private FuzzyValue addInpatient()
throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
    return addTerm(Term.IN_PATIENT.name(), new TriangleFuzzySet(24, 28, 32));
}

private FuzzyValue addPhysicalIntensiveInPatient()
throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
    return addTerm(Term.PHYSICAL_INTENSIVE_IN_PATIENT.name(), new LeftLinearFuzzySet(29, 31));
}

public Term[] getFuzzyLinguisticTerms() {
    return Term.values();
}

public static enum Term {
    ADVICE, BRIEF_COUNSELING, OUT_PATIENT, INTENSIVE_OUT_PATIENT, IN_PATIENT, PHYSICAL_INTENSIVE_IN_PATIENT
}
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol;
```

```
import nrc.fuzzy.FuzzyValue;
import nrc.fuzzy.FuzzyVariable;
import nrc.fuzzy.InvalidFuzzyVariableNameException;
import nrc.fuzzy.InvalidFuzzyVariableTermNameException;
import nrc.fuzzy.InvalidUODRangeException;
import nrc.fuzzy.LeftLinearFuzzySet;
import nrc.fuzzy.SingletonFuzzySet;
import nrc.fuzzy.TriangleFuzzySet;
import nrc.fuzzy.XValueOutsideUODException;
import nrc.fuzzy.XValuesOutOfOrderException;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.H2R2EFuzzyVariable;

/**
 * @author Duy B. Vo
 */
public class BingeDrinkingRiskVariable extends H2R2EFuzzyVariable<BingeDrinkingRiskVariable.Term> {
    public BingeDrinkingRiskVariable()
    throws InvalidUODRangeException,
    InvalidFuzzyVariableNameException,
    XValuesOutOfOrderException,
    XValueOutsideUODException,
    InvalidFuzzyVariableTermNameException {
        super(BingeDrinkingRiskVariable.class, 0, 7, null);
        addNoRisk();
        addModerateRisk();
        addHighRisk();
        addVeryHighRisk();
    }

    private FuzzyValue addNoRisk()
    throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.NO_RISK.name(), new SingletonFuzzySet(0));
    }

    private FuzzyValue addModerateRisk()
    throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.MODERATE_RISK.name(), new TriangleFuzzySet(1, 2));
    }

    private FuzzyValue addHighRisk()
    throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.HIGH_RISK.name(), new TriangleFuzzySet(2, 4));
    }

    private FuzzyValue addVeryHighRisk()
    throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.VERY_HIGH_RISK.name(), new LeftLinearFuzzySet(4, 5));
    }

    public Term[] getFuzzyLinguisticTerms() {
        return Term.values();
    }

    public static enum Term {
        NO_RISK, MODERATE_RISK, HIGH_RISK, VERY_HIGH_RISK
    }
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol;
```

```
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.H2R2EFuzzyVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.CigaretteSuggestedCareVariable.Term;
import nrc.fuzzy.InvalidUODRangeException;
import nrc.fuzzy.InvalidFuzzyVariableTermNameException;
import nrc.fuzzy.InvalidFuzzyVariableNameException;
import nrc.fuzzy.XValuesOutOfOrderException;
import nrc.fuzzy.XValueOutsideUODException;
```

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```
import nrc.fuzzy.TriangleFuzzySet;
import nrc.fuzzy.SingletonFuzzySet;

/**
 * Values provided by Dr. Sean Laraway.
 *
 * @author Duy B. Vo <dvo@email.sjsu.edu>
 */
public class CigaretteSuggestedCareVariable extends H2R2EFuzzyVariable<Term> {
    public CigaretteSuggestedCareVariable()
        throws XValuesOutOfOrderException, XValueOutsideUODEException, InvalidFuzzyVariableTermNameException,
        InvalidUODRangeException, InvalidFuzzyVariableNameException {
        super(CigaretteSuggestedCareVariable.class, 0, 2, null);

        for (Term term : getFuzzyLinguisticTerms()) {
            addTerm(term.name(), new SingletonFuzzySet(term.ordinal()));
        }
    }

    public Term[] getFuzzyLinguisticTerms() {
        return Term.values();
    }

    public static enum Term {
        ADVICE, BRIEF_COUNSELING, OUT_PATIENT
    }
}

package edu.sjsu.cs.duybaovo.h2r2e.business.engine.variable.alcohol;

import edu.sjsu.cs.duybaovo.h2r2e.business.engine.variable.H2R2EFuzzyVariable;
import nrc.fuzzy.FuzzyValue;
import nrc.fuzzy.InvalidFuzzyVariableNameException;
import nrc.fuzzy.InvalidFuzzyVariableTermNameException;
import nrc.fuzzy.InvalidUODRangeException;
import nrc.fuzzy.LeftLinearFuzzySet;
import nrc.fuzzy.RightLinearFuzzySet;
import nrc.fuzzy.TriangleFuzzySet;
import nrc.fuzzy.XValueOutsideUODEException;
import nrc.fuzzy.XValuesOutOfOrderException;

/**
 * From email from Dr. Sean Laraway
 * Originally:
 * For the fuzzy categories, we could break the AD score into quartiles in the following way: 0-2 (low risk),
 * 3-5 (moderate risk), 6-8 (high risk), 9-12 (very high risk).
 * <p/>
 * But modified as seen in code.
 *
 * @author Duy B. Vo
 */
public class EmpiricallyBasedADSRiskVariable extends H2R2EFuzzyVariable<EmpiricallyBasedADSRiskVariable.Term> {
    public EmpiricallyBasedADSRiskVariable()
        throws XValuesOutOfOrderException, XValueOutsideUODEException, InvalidFuzzyVariableTermNameException,
        InvalidUODRangeException, InvalidFuzzyVariableNameException {
        super(EmpiricallyBasedADSRiskVariable.class, 0, 12, null);
        addLowRisk();
        addModerateRisk();
        addHighRisk();
        addVeryHighRisk();
    }

    private FuzzyValue addLowRisk()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.LOW_RISK.name(), new RightLinearFuzzySet(1, 3));
    }

    private FuzzyValue addModerateRisk()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.MODERATE_RISK.name(), new TriangleFuzzySet(2, 4, 6));
    }

    private FuzzyValue addHighRisk()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.HIGH_RISK.name(), new TriangleFuzzySet(5, 7, 9));
    }

    private FuzzyValue addVeryHighRisk()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.VERY_HIGH_RISK.name(), new LeftLinearFuzzySet(8, 10));
    }

    public Term[] getFuzzyLinguisticTerms() {
        return Term.values();
    }

    public static enum Term {
        LOW_RISK, MODERATE_RISK, HIGH_RISK, VERY_HIGH_RISK
    }
}

package edu.sjsu.cs.duybaovo.h2r2e.business.engine.variable.socioeconomic;
```

```
import nrc.fuzzy.FuzzyValue;
import nrc.fuzzy.FuzzyVariable;
import nrc.fuzzy.InvalidFuzzyVariableNameException;
import nrc.fuzzy.InvalidFuzzyVariableTermNameException;
import nrc.fuzzy.InvalidUODRangeException;
import nrc.fuzzy.RightLinearFuzzySet;
import nrc.fuzzy.TrapezoidFuzzySet;
import nrc.fuzzy.TriangleFuzzySet;
import nrc.fuzzy.XValueOutsideUODEException;
import nrc.fuzzy.XValuesOutOfOrderException;
import nrc.fuzzy.LeftLinearFuzzySet;

/**
 * http://www.sdhc.net/pdfsdocs/ami2003.pdf
 * @author Duy B. Vo
 */
public class IncomeFuzzyVariable extends FuzzyVariable {
    public IncomeFuzzyVariable()
        throws InvalidUODRangeException, InvalidFuzzyVariableNameException, XValuesOutOfOrderException,
        XValueOutsideUODEException, InvalidFuzzyVariableTermNameException {
        super(IncomeFuzzyVariable.class.getSimpleName(), 0, 5, "percent");

        addExtremelyLowIncome();
        addVeryLowIncome();
        addLowIncome();
        addModerateIncome();
        addAboveModerate();
        addWealthy();
        addVeryWealthy();
    }

    private FuzzyValue addExtremelyLowIncome()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return null;
    }

    private FuzzyValue addVeryLowIncome()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.VERY_LOW.name(), new RightLinearFuzzySet(.40, .55));
    }

    private FuzzyValue addLowIncome()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.LOW.name(), new TrapezoidFuzzySet(.5, .60, .75, .85));
    }

    private FuzzyValue addModerateIncome()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.MODERATE.name(), new TriangleFuzzySet(.8, 1, 1.2));
    }

    private FuzzyValue addAboveModerate()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.ABOVE_MODERATE.name(), new TriangleFuzzySet(1, 1.3, 1.8));
    }

    private FuzzyValue addWealthy()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.WEALTHY.name(), new TriangleFuzzySet(1.5, 2.1, 2.7));
    }

    private FuzzyValue addVeryWealthy()
        throws XValueOutsideUODEException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.VERY_WEALTHY.name(), new LeftLinearFuzzySet(2.5, 3.5));
    }

    public static enum Term {
        VERY_LOW, LOW, MODERATE, ABOVE_MODERATE, WEALTHY, VERY_WEALTHY
    }

    public static final double ANNUAL_AMI = 5449.00 * 12;
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.tobacco;
```

```
import nrc.fuzzy.FuzzyValue;
import nrc.fuzzy.InvalidFuzzyVariableNameException;
import nrc.fuzzy.InvalidFuzzyVariableTermNameException;
import nrc.fuzzy.InvalidUODRangeException;
import nrc.fuzzy.LeftLinearFuzzySet;
import nrc.fuzzy.RightLinearFuzzySet;
import nrc.fuzzy.TriangleFuzzySet;
import nrc.fuzzy.XValueOutsideUODEException;
import nrc.fuzzy.XValuesOutOfOrderException;
import nrc.fuzzy.TrapezoidFuzzySet;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.H2R2EFuzzyVariable;

/**
 * From email from Dr. Sean Laraway
 * Originally:
 * For the CDS, we will again sum the scores to get a total Cigarette Dependence (CD) score (with a minimum of 12 and
 * a maximum of 60). Again we can break the total CD score into quartiles: 12-23 (low risk), 24-35 (moderate risk),
 * 36-47 (high risk), 48-60 (very high risk).
 */
```


Heuristic Health Resource Referral (H2R2) Engine

```
* But modified as seen in code.
*
* @author Duy B. Vo
*/
public class CigaretteDependenceScale12RiskVariable
extends H2R2EFuzzyVariable<CigaretteDependenceScale12RiskVariable.Term> {
    public CigaretteDependenceScale12RiskVariable()
    throws XValuesOutOfOrderException, XValueOutsideUODException, InvalidFuzzyVariableTermNameException,
    InvalidUODRangeException, InvalidFuzzyVariableNameException {
        super(CigaretteDependenceScale12RiskVariable.class, 0, 60, null);
        addLowRisk();
        addModerateRisk();
        addHighRisk();
        addVeryHighRisk();
    }

    private FuzzyValue addLowRisk()
    throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.LOW_RISK.name(), new RightLinearFuzzySet(12, 25));
    }

    private FuzzyValue addModerateRisk()
    throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.MODERATE_RISK.name(), new TriangleFuzzySet(20, 30, 40));
    }

    private FuzzyValue addHighRisk()
    throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.HIGH_RISK.name(), new TrapezoidFuzzySet(35, 41, 44, 50));
    }

    private FuzzyValue addVeryHighRisk()
    throws XValueOutsideUODException, XValuesOutOfOrderException, InvalidFuzzyVariableTermNameException {
        return addTerm(Term.VERY_HIGH_RISK.name(), new LeftLinearFuzzySet(45, 55));
    }

    public Term[] getFuzzyLinguisticTerms() {
        return Term.values();
    }

    public static enum Term {
        LOW_RISK, MODERATE_RISK, HIGH_RISK, VERY_HIGH_RISK
    }
}
```

```
package edu.sjsu.cs.duybao.h2r2e.business.engine.variable;
```

```
import nrc.fuzzy.FuzzyVariable;
import nrc.fuzzy.InvalidFuzzyVariableNameException;
import nrc.fuzzy.InvalidUODRangeException;
```

```
/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public abstract class H2R2EFuzzyVariable<F> extends FuzzyVariable {
    protected H2R2EFuzzyVariable(
        final Class variableClass, final int lowerBound, final int upperBound, final String unit)
    throws InvalidFuzzyVariableNameException, InvalidUODRangeException {
        super(variableClass.getSimpleName(), lowerBound, upperBound, unit);
    }

    public abstract F[] getFuzzyLinguisticTerms();
}
```

```
package edu.sjsu.cs.duybao.h2r2e.business.engine;
```

```
import nrc.fuzzy.FuzzyValue;
import nrc.fuzzy.IncompatibleFuzzyValuesException;
import nrc.fuzzy.InvalidLinguisticExpressionException;
import nrc.fuzzy.SimilarityOperator;
import nrc.fuzzy.SimilarityByAreaOperator;
import nrc.fuzzy.SimilarityByPossibilityOperator;
```

```
import java.util.Enumeration;
```

```
/**
 * @author Duy B. Vo
 */
public class FuzzyUtil {
    private FuzzyUtil() {
    }

    public static String getBestMatchedTerm(final FuzzyValue value)
    throws IncompatibleFuzzyValuesException, InvalidLinguisticExpressionException {
        double maxSimilarity = 0;
        String matchedTerm = null;
        if (value == null) {
            return null;
        }
        Enumeration termName = value.getFuzzyVariable().findTermNames();
        while (termName.hasMoreElements()) {
            final String _tmp_name = (String)termName.nextElement();
            final FuzzyValue comparisonFuzzyValue = new FuzzyValue(value.getFuzzyVariable(), _tmp_name.toUpperCase());
```

Heuristic Health Resource Referral (H2R2) Engine

```
final double similarity = value.similarity(comparisonFuzzyValue, MAIN_SIMILARITY_OPERATOR);
if (maxSimilarity < similarity) {
    maxSimilarity = similarity;
    matchedTerm = _tmp_name;
}
}

if (matchedTerm == null) {
    termName = value.getFuzzyVariable().findTermNames();
    while (termName.hasMoreElements()) {
        final String _tmp_name = (String)termName.nextElement();
        final FuzzyValue comparisonFuzzyValue = new FuzzyValue(value.getFuzzyVariable(), _tmp_name.toUpperCase());
        final double similarity = value.similarity(comparisonFuzzyValue, SECONDARY_SIMILARITY_OPERATOR);
        if (maxSimilarity < similarity) {
            maxSimilarity = similarity;
            matchedTerm = _tmp_name;
        }
    }
}

return matchedTerm;
}

private static final SimilarityOperator MAIN_SIMILARITY_OPERATOR = new SimilarityByAreaOperator();
private static final SimilarityOperator SECONDARY_SIMILARITY_OPERATOR = new SimilarityByPossibilityOperator();
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.business.engine;

import edu.sjsu.cs.duybaovo.h2r2c.bo.HealthResource;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.exception.H2R2EException;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.H2R2EFuzzyVariable;
import hygeia.bo.account.User;
import nrc.fuzzy.IncompatibleFuzzyValuesException;
import nrc.fuzzy.IncompatibleRuleInputsException;
import nrc.fuzzy.InvalidFuzzyVariableNameException;
import nrc.fuzzy.InvalidFuzzyVariableTermNameException;
import nrc.fuzzy.InvalidLinguisticExpressionException;
import nrc.fuzzy.InvalidUODRangeException;
import nrc.fuzzy.XValueOutsideUODException;
import nrc.fuzzy.XValuesOutOfOrderException;
import org.apache.lucene.queryParser.ParseException;

import java.util.Set;
import java.util.List;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public interface H2R2Engine {

    Set<HealthResource> getResources(final User user, final Integer limit) throws H2R2EException;

    <T extends Enum, V extends H2R2EFuzzyVariable<T>> T deriveFuzzyValueForUser(
        final String username, final Class<V> fuzzyVariable) throws H2R2EException;

    List<String> retrieveOutputForUser(final String username) throws H2R2EException;
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.business.engine;

import edu.sjsu.cs.duybaovo.h2r2c.bo.HealthResource;
import edu.sjsu.cs.duybaovo.h2r2c.bo.HealthResource.CommercialClassification;
import edu.sjsu.cs.duybaovo.h2r2c.bo.HealthResource.Type;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.exception.H2R2EException;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.rule.AlcoholSuggestedCareRuleSet;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.H2R2EFuzzyVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.AlcoholSuggestedCareVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.AlcoholicConsumptionVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.BingeDrinkingRiskVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.CigaretteSuggestedCareVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.EmpiricallyBasedADSRiskVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.socioeconomic.IncomeFuzzyVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.tobacco.CigaretteDependenceScale12RiskVariable;
import edu.sjsu.cs.duybaovo.h2r2c.model.dao.HealthResourceDao;
import hygeia.aspect.logging.BusinessAuditLog;
import hygeia.bo.account.User;
import hygeia.bo.information.FinancialInformation;
import hygeia.bo.information.IdentityInformation;
import hygeia.bo.information.contact.Address;
import hygeia.bo.information.contact.ContactInformation;
import hygeia.bo.pchr.externalFactor.Consumption;
import hygeia.bo.pchr.questionnaire.CigaretteDependenceScale12;
import hygeia.bo.pchr.questionnaire.EmpiricallyBasedAlcoholDependenceScale;
import hygeia.model.information.dao.FinancialInformationDao;
import hygeia.model.information.dao.IdentityInformationDao;
import hygeia.model.information.dao.contact.ContactInformationDao;
import hygeia.model.pchr.dao.ConsumptionDao;
import hygeia.model.pchr.dao.questionnaire.CigaretteDependenceScale12Dao;
import hygeia.model.pchr.dao.questionnaire.EmpiricallyBasedAlcoholDependenceScaleDao;
import hygeia.common.util.locale.SupportedISO639Key;
import nrc.fuzzy.FuzzyException;
import nrc.fuzzy.FuzzyValue;
```

Heuristic Health Resource Referral (H2R2) Engine

```
import nrc.fuzzy.SingletonFuzzySet;
import nrc.fuzzy.TriangleFuzzySet;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Component;
import org.springframework.transaction.annotation.Transactional;
import org.apache.commons.lang.StringUtils;

import java.util.LinkedHashSet;
import java.util.List;
import java.util.Set;
import java.util.ArrayList;

/**
 * http://sanjose.bizjournals.com/albuquerque/stories/2007/03/12/story3.html?jst=s_cn_hl
 *
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Component(value = "edu.sjsu.cs.duybaovo.h2r2e.business.engine.H2R2FuzzyLogicEngine")
public class H2R2FuzzyLogicEngine implements H2R2Engine {

    @BusinessAuditLog
    @Transactional
    public Set<HealthResource> getResources(final User user, final Integer limit) throws H2R2Exception {
        final String username = user.getUsername();

        final AlcoholSuggestedCareVariable.Term alcoholSuggestedCare;
        try {
            alcoholSuggestedCare = deriveAlcoholSuggestedCareValue(username);
        } catch (FuzzyException e) {
            throw new H2R2Exception(e);
        }

        final String city = deriveCity(username);

        final Set<CommericalClassification> commericalClassifications = deriveCommericalClassifications(username);

        final CigaretteSuggestedCareVariable.Term cigaretteSuggestedCare =
            deriveFuzzyValueForUser(username, CigaretteSuggestedCareVariable.class);

        if (alcoholSuggestedCare == null || cigaretteSuggestedCare == null) {
            return new LinkedHashSet<HealthResource>();
        }

        final LinkedHashSet<HealthResource> finalResources = new LinkedHashSet<HealthResource>();

        //Alcohol
        finalResources.addAll(retrieveHealthResourceForSuggestedCare(
            limit, city, commericalClassifications, Type.ALCOHOL, alcoholSuggestedCare));

        //Cigarette
        finalResources.addAll(retrieveHealthResourceForSuggestedCare(
            limit, city, commericalClassifications, Type.CIGARETTE, cigaretteSuggestedCare));

        return finalResources;
    }

    private List<HealthResource> retrieveHealthResourceForSuggestedCare(
        final Integer limit,
        final String city,
        final Set<CommericalClassification> commericalClassifications,
        final Type searchType,
        final Enum suggestedCare) {
        final List<HealthResource> resultsFromDb = healthResourceDao.retrieveRelevantResources(
            null, limit, city, commericalClassifications, searchType, suggestedCare);
        final List<HealthResource> finalResources = new ArrayList<HealthResource>(resultsFromDb.size());

        for (HealthResource healthResource : resultsFromDb) {
            final Set<String> associatedCare = healthResource.getAssociatedSuggestCare();
            if (associatedCare.contains(suggestedCare.name())) {
                finalResources.add(healthResource);
            }
        }

        return finalResources;
    }

    private String deriveCity(final String username) {
        final ContactInformation contactInfo = contactInfoDao.retrieveEntityForUser(username);
        if (contactInfo != null) {
            final Address address = contactInfo.getPrimaryAddress();
            if (address != null) {
                return address.getCity();
            }
        }

        return null;
    }

    private Set<CommericalClassification> deriveCommericalClassifications(final String username) throws H2R2Exception {
        final FinancialInformation financialInfo = financialDao.retrieveEntityForUser(username);
        final Set<CommericalClassification> commericalClassifications =
            new LinkedHashSet<CommericalClassification>(CommericalClassification.values().length);

        if (financialInfo != null) {
            if (financialInfo.getAnnualIncome() != null) {

```

Heuristic Health Resource Referral (H2R2) Engine

```
try {
    final double incomeAsPercentageOfAMI = financialInfo.getAnnualIncome() / IncomeFuzzyVariable.ANNUAL_AMI;
    final TriangleFuzzySet incomeInputSet = new TriangleFuzzySet(
        Math.max(incomeAsPercentageOfAMI - .005, 0),
        incomeAsPercentageOfAMI,
        Math.min(incomeAsPercentageOfAMI + .005, 10000.00));
    final FuzzyValue inputIncome = new FuzzyValue(new IncomeFuzzyVariable(), incomeInputSet);
    final IncomeFuzzyVariable.Term incomeClassification =
        IncomeFuzzyVariable.Term.valueOf(FuzzyUtil.getBestMatchedTerm(inputIncome).toUpperCase());

    final int incomeOrdinal = incomeClassification.ordinal();
    if (incomeOrdinal > IncomeFuzzyVariable.Term.ABOVE_MODERATE.ordinal()) {
        commercialClassifications.add(CommericalClassification.COMMERCIAL);
    } else if (incomeOrdinal <= IncomeFuzzyVariable.Term.ABOVE_MODERATE.ordinal()
        && incomeOrdinal >= IncomeFuzzyVariable.Term.MODERATE.ordinal()) {
        commercialClassifications.add(CommericalClassification.COMMERCIAL);
        commercialClassifications.add(CommericalClassification.SUBSIDIZED);
    } else if (incomeOrdinal <= IncomeFuzzyVariable.Term.LOW.ordinal()
        && incomeOrdinal > IncomeFuzzyVariable.Term.VERY_LOW.ordinal()) {
        commercialClassifications.add(CommericalClassification.SUBSIDIZED);
        commercialClassifications.add(CommericalClassification.FREE);
    } else if (incomeOrdinal == IncomeFuzzyVariable.Term.VERY_LOW.ordinal()) {
        commercialClassifications.add(CommericalClassification.FREE);
    }
} catch (FuzzyException e) {
    throw new H2R2Exception(e);
}
}
}

return commercialClassifications;
}

private AlcoholSuggestedCareVariable.Term deriveAlcoholSuggestedCareValue(final String username)
throws FuzzyException {
    final Consumption consumption = consumptionDao.retrieveEntityForUser(username);
    final EmpiricallyBasedAlcoholDependenceScale ebAds = ebAdsDao.retrieveEntityForUser(username);
    final IdentityInformation idInfo = idDao.retrieveEntityForUser(username);

    if (consumption == null || ebAds == null) {
        return null;
    } else {
        final AlcoholSuggestedCareRuleSet alcoholCareRuleset =
            new AlcoholSuggestedCareRuleSet(consumption, ebAds, idInfo.getSex());

        return alcoholCareRuleset.getResultFromRuleExecution();
    }
}

public <T extends Enum, V extends H2R2FuzzyVariable<T>> T deriveFuzzyValueForUser(
    final String username, final Class<V> variableClass) throws H2R2Exception {
    if (StringUtil.isBlank(username) || variableClass == null) {
        return null;
    } else {
        try {
            final IdentityInformation idInfo = idDao.retrieveEntityForUser(username);

            if (AlcoholicConsumptionVariable.class.equals(variableClass)) {
                final Consumption consumption = consumptionDao.retrieveEntityForUser(username);
                if (consumption != null && consumption.getDrinksPerWeek() != null) {
                    return (T) AlcoholicConsumptionVariable.Term.valueOf(deriveFuzzyTerm(
                        new AlcoholicConsumptionVariable(idInfo.getSex(), consumption.getDrinksPerWeek()));
                }
            } else if (BingeDrinkingRiskVariable.class.equals(variableClass)) {
                final Consumption consumption = consumptionDao.retrieveEntityForUser(username);
                if (consumption != null && consumption.getBingeDrinkPerWeek() != null) {
                    return (T) BingeDrinkingRiskVariable.Term.valueOf(deriveFuzzyTerm(
                        new BingeDrinkingRiskVariable(), consumption.getBingeDrinkPerWeek()));
                }
            } else if (CigaretteDependenceScale12RiskVariable.class.equals(variableClass)) {
                final CigaretteDependenceScale12 cds12Scale = cds12Dao.retrieveEntityForUser(username);
                if (cds12Scale != null) {
                    return (T) CigaretteDependenceScale12RiskVariable.Term.valueOf(deriveFuzzyTerm(
                        new CigaretteDependenceScale12RiskVariable(), cds12Scale.getScore()));
                }
            } else if (EmpiricallyBasedADSRiskVariable.class.equals(variableClass)) {
                final EmpiricallyBasedAlcoholDependenceScale ebAds = ebAdsDao.retrieveEntityForUser(username);
                if (ebAds != null) {
                    return (T) EmpiricallyBasedADSRiskVariable.Term.valueOf(deriveFuzzyTerm(
                        new EmpiricallyBasedADSRiskVariable(), ebAds.deriveTotalScore()));
                }
            } else if (AlcoholSuggestedCareVariable.class.equals(variableClass)) {
                return (T) deriveAlcoholSuggestedCareValue(username);
            } else if (CigaretteSuggestedCareVariable.class.equals(variableClass)) {
                final CigaretteDependenceScale12 cds12Scale = cds12Dao.retrieveEntityForUser(username);
                if (cds12Scale != null) {
                    final CigaretteDependenceScale12RiskVariable.Term cdsTerm =
                        CigaretteDependenceScale12RiskVariable.Term.valueOf(
                            deriveFuzzyTerm(new CigaretteDependenceScale12RiskVariable(), cds12Scale.getScore()));
                    switch (cdsTerm) {
                        case LOW_RISK:
                            return (T) CigaretteSuggestedCareVariable.Term.ADVISE;
                        case MODERATE_RISK:
                            return (T) CigaretteSuggestedCareVariable.Term.BRIEF_COUNSELING;
                        default:
                            return (T) CigaretteSuggestedCareVariable.Term.OUTPATIENT;
                    }
                }
            }
        }
    }
}
```

Heuristic Health Resource Referral (H2R2) Engine

```
    }
    }
    } catch (FuzzyException e) {
        throw new H2R2EException(e);
    }
}

return null;
}

public List<String> retrieveOutputForUser(final String username) throws H2R2EException {
    final List<String> output = new ArrayList<String>(4);
    final String NA = "N/A";

    final String city = deriveCity(username);
    final Set<CommercialClassification> commercialClassifications = deriveCommercialClassifications(username);

    final AlcoholSuggestedCareVariable.Term alcoholSuggestedCare;
    try {
        alcoholSuggestedCare = deriveAlcoholSuggestedCareValue(username);
    } catch (FuzzyException e) {
        throw new H2R2EException(e);
    }

    if (alcoholSuggestedCare != null) {
        output.add(alcoholSuggestedCare.name());
        final List<HealthResource> healthResource = retrieveHealthResourceForSuggestedCare(
            1, city, commercialClassifications, Type.ALCOHOL, alcoholSuggestedCare);
        if (!healthResource.isEmpty()) {
            output.add(healthResource.get(0).getLocalizedNames(SupportedIso639Key.en));
        } else {
            output.add(NA);
        }
    } else {
        //One for suggested care, one for resource
        output.add(NA);
        output.add(NA);
    }

    final CigaretteSuggestedCareVariable.Term cigaretteSuggestedCare =
        deriveFuzzyValueForUser(username, CigaretteSuggestedCareVariable.class);
    if (cigaretteSuggestedCare != null) {
        output.add(cigaretteSuggestedCare.name());
        final List<HealthResource> healthResource = retrieveHealthResourceForSuggestedCare(
            1, city, commercialClassifications, Type.CIGARETTE, cigaretteSuggestedCare);
        if (!healthResource.isEmpty()) {
            output.add(healthResource.get(0).getLocalizedNames(SupportedIso639Key.en));
        } else {
            output.add(NA);
        }
    } else {
        //One for suggested care, one for resource
        output.add(NA);
        output.add(NA);
    }

    return output;
}

private static String deriveFuzzyTerm(
    final H2R2E.FuzzyVariable fuzzyVariable, final double value)
    throws FuzzyException {
    final SingletonFuzzySet inputSet = new SingletonFuzzySet(value);
    final FuzzyValue inputValue = new FuzzyValue(fuzzyVariable, inputSet);
    return FuzzyUtil.getBestMatchedTerm(inputValue).toUpperCase();
}

@Autowired
private IdentityInformationDao idlDao;

@Autowired
private FinancialInformationDao financialDao;

@Autowired
private ConsumptionDao consumptionDao;

@Autowired
private ContactInformationDao contactInfoDao;

@Autowired
private HealthResourceDao healthResourceDao;

@Autowired
private CigaretteDependenceScale12Dao cds12Dao;

@Autowired
private EmpiricallyBasedAlcoholDependenceScaleDao cbAdsDao;
}

package edu.sjsu.cs.duybaovo.h2r2e.business.operation;

import hygeia.business.common.operation.HygeiaOperation;
```

Heuristic Health Resource Referral (H2R2) Engine

```
import hygeia.bo.account.User;
import edu.sjsu.cs.duybaovo.h2r2c.bo.HealthResource;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.exception.H2R2EException;

import java.util.Set;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public interface HealthResourceOperation extends HygeiaOperation<HealthResource> {

    Set<HealthResource> getHealthResourcesForUser(final User user) throws H2R2EException;

}

package edu.sjsu.cs.duybaovo.h2r2c.business.operation;

import edu.sjsu.cs.duybaovo.h2r2c.bo.TestUserAnswer;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.AlcoholSuggestedCareVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.CigaretteSuggestedCareVariable;
import hygeia.business.common.operation.HygeiaOperation;
import hygeia.bo.account.User;

import java.util.Set;

/**
 * @author Duy B. Vo <dvo@email.sjsu.edu>
 */
public interface TestUserAnswerOperation extends HygeiaOperation<TestUserAnswer> {

    TestUserAnswer registerAnswer(
        String username,
        AlcoholSuggestedCareVariable.Term alcoholSuggestedCare,
        String alcoholResource,
        CigaretteSuggestedCareVariable.Term cigaretteSuggestedCare,
        String cigaretteResource);

    Set<TestUserAnswer> getUsers();

}

package edu.sjsu.cs.duybaovo.h2r2c.business.operation.impl;

import hygeia.business.common.operation.AbstractHygeiaOperation;
import hygeia.bo.account.User;
import hygeia.aspect.logging.BusinessAuditLog;
import edu.sjsu.cs.duybaovo.h2r2c.bo.HealthResource;
import edu.sjsu.cs.duybaovo.h2r2c.model.dao.HealthResourceDao;
import edu.sjsu.cs.duybaovo.h2r2c.business.operation.HealthResourceOperation;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.H2R2Engine;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.exception.H2R2EException;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Component;
import org.springframework.transaction.annotation.Transactional;

import java.util.Set;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Component(value = "edu.sjsu.cs.duybaovo.h2r2c.business.operation.impl.HealthResourceOperationImpl")
public class HealthResourceOperationImpl
    extends AbstractHygeiaOperation<HealthResourceDao, HealthResource> implements HealthResourceOperation {

    @Autowired
    private HealthResourceDao dao;

    @Autowired
    private H2R2Engine engine;

    public HealthResourceDao getDao() {
        return dao;
    }

    @BusinessAuditLog
    @Transactional
    public Set<HealthResource> getHealthResourcesForUser(final User user) throws H2R2EException {
        return engine.getResources(user, null);
    }

}

package edu.sjsu.cs.duybaovo.h2r2c.business.operation.impl;

import edu.sjsu.cs.duybaovo.h2r2c.bo.TestUserAnswer;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.AlcoholSuggestedCareVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.CigaretteSuggestedCareVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.operation.TestUserAnswerOperation;
import edu.sjsu.cs.duybaovo.h2r2c.model.dao.TestUserAnswerDao;
import hygeia.aspect.logging.BusinessAuditLog;
import hygeia.business.common.operation.AbstractHygeiaOperation;
import hygeia.bo.account.User;
import org.springframework.beans.factory.annotation.Autowired;
```

Heuristic Health Resource Referral (H2R2) Engine

```
import org.springframework.stereotype.Component;
import org.springframework.transaction.annotation.Transactional;

import java.util.Set;

/**
 * @author Duy B. Vo <dvo@email.sjsu.edu>
 */
@Component(value = "edu.sjsu.cs.duybaovo.h2r2c.business.operation.impl.TestUserAnswerOperationImpl")
public class TestUserAnswerOperationImpl
    extends AbstractHygeiaOperation<TestUserAnswerDao, TestUserAnswer> implements TestUserAnswerOperation {

    protected TestUserAnswerDao getDao() {
        return dao;
    }

    @BusinessAuditLog
    @Transactional
    public TestUserAnswer registerAnswer(
        final String username,
        final AlcoholSuggestedCareVariable.Term alcoholSuggestedCare,
        final String alcoholResource,
        final CigaretteSuggestedCareVariable.Term cigaretteSuggestedCare,
        final String cigaretteResource) {

        final TestUserAnswer testUserAnswer = dao.retrieveTestUser(username);
        testUserAnswer.setAlcoholSuggestedCare(alcoholSuggestedCare);
        testUserAnswer.setAlcoholResource(alcoholResource);
        testUserAnswer.setCigaretteSuggestedCare(cigaretteSuggestedCare);
        testUserAnswer.setCigaretteResource(cigaretteResource);
        dao.createOrUpdateEntity("admin", testUserAnswer);

        return testUserAnswer;
    }

    public Set<TestUserAnswer> getUsers() {
        return dao.retrieveEntities(null, null);
    }

    @Autowired
    private TestUserAnswerDao dao;
}
```

```
package edu.sjsu.cs.duybaovo.h2r2c.bo;

import hygeia.bo.common.DatabaseEntity;
import org.hibernate.validator.NotNull;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.AlcoholSuggestedCareVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.CigaretteSuggestedCareVariable;
import edu.sjsu.cs.duybaovo.h2r2c.business.engine.variable.alcohol.AlcoholSuggestedCareVariable.Term;

import javax.persistence.Enumerated;
import javax.persistence.EnumType;
import javax.persistence.Entity;

/**
 * @author Duy B. Vo <dvo@email.sjsu.edu>
 */
@Entity
public class TestUserAnswer extends DatabaseEntity {

    public String getUsername() {
        return username;
    }

    public void setUsername(final String username) {
        this.username = username;
    }

    public Term getAlcoholSuggestedCare() {
        return alcoholSuggestedCare;
    }

    public void setAlcoholSuggestedCare(final Term alcoholSuggestedCare) {
        this.alcoholSuggestedCare = alcoholSuggestedCare;
    }

    public String getAlcoholResource() {
        return alcoholResource;
    }

    public void setAlcoholResource(final String alcoholResource) {
        this.alcoholResource = alcoholResource;
    }

    public CigaretteSuggestedCareVariable.Term getCigaretteSuggestedCare() {
        return cigaretteSuggestedCare;
    }

    public void setCigaretteSuggestedCare(final CigaretteSuggestedCareVariable.Term cigaretteSuggestedCare) {
        this.cigaretteSuggestedCare = cigaretteSuggestedCare;
    }

    public String getCigaretteResource() {

```

Heuristic Health Resource Referral (H2R2) Engine

```
        return cigaretteResource;
    }

    public void setCigaretteResource(final String cigaretteResource) {
        this.cigaretteResource = cigaretteResource;
    }

    @NotNull
    private String username;

    @Enumerated(value = EnumType.STRING)
    private AlcoholSuggestedCareVariable.Term alcoholSuggestedCare;

    private String alcoholResource;

    @Enumerated(value = EnumType.STRING)
    private CigaretteSuggestedCareVariable.Term cigaretteSuggestedCare;

    private String cigaretteResource;
}
```

```
package hygeia.bo.pchr.externalFactor;

import hygeia.bo.common.DatabaseEntity;
import hygeia.common.util.bean.HashCodeContributor;
import org.hibernate.validator.Max;
import org.hibernate.validator.Min;

import javax.persistence.Entity;

/**
 * @author Duy B. Vo
 */
@Entity
public class Consumption extends DatabaseEntity {

    @HashCodeContributor
    @Min(0)
    @Max(168)
    private Integer drinksPerWeek;

    @HashCodeContributor
    @Min(0)
    @Max(7)
    private Integer bingeDrinkPerWeek;

    @HashCodeContributor
    @Min(0)
    @Max(4)
    private Double packsPerDay;

    public Integer getDrinksPerWeek() {
        return drinksPerWeek;
    }

    public void setDrinksPerWeek(final Integer drinksPerWeek) {
        this.drinksPerWeek = drinksPerWeek;
    }

    public Double getPacksPerDay() {
        return packsPerDay;
    }

    public void setPacksPerDay(final Double packsPerDay) {
        this.packsPerDay = packsPerDay;
    }

    public Integer getBingeDrinkPerWeek() {
        return bingeDrinkPerWeek;
    }

    public void setBingeDrinkPerWeek(final Integer bingeDrinkPerWeek) {
        this.bingeDrinkPerWeek = bingeDrinkPerWeek;
    }
}
```

```
package hygeia.bo.pchr.questionnaire;

import hygeia.bo.common.DatabaseEntity;
import org.hibernate.annotations.Cascade;
import org.hibernate.annotations.CascadeType;
import org.hibernate.annotations.CollectionOfElements;
import org.hibernate.annotations.MapKey;
import org.hibernate.annotations.Parameter;
import org.hibernate.annotations.Type;
import org.hibernate.validator.NotEmpty;
import org.hibernate.validator.NotNull;

import javax.persistence.EnumType;
import javax.persistence.Enumerated;
import javax.persistence.FetchType;
import javax.persistence.Entity;
import java.util.HashMap;
```


Heuristic Health Resource Referral (H2R2) Engine

```
import java.util.Map;

/**
 * From A comparison of the content-, construct- and predictive validity of the cigarette dependence scale and
 * the Fagerström test for nicotine dependence
 * By Etter
 * <p/>
 * From Dr. Sean Laraway
 *
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Entity
public class CigaretteDependenceScale12 extends DatabaseEntity {

    @Cascade(CascadeType.DELETE_ORPHAN)
    @CollectionOfElements(fetch = FetchType.EAGER)
    @Enumerated(EnumType.STRING)
    @MapKey(
        type = @Type(
            type = "org.hibernate.type.EnumType",
            parameters = @Parameter(
                name = "enumClass",
                value = "hygeia.bo.pchr.questionnaire.CigaretteDependenceScale12Question"))
    )
    @NotEmpty
    @NotNull
    private Map<CigaretteDependenceScale12Question, String> response =
        new HashMap<CigaretteDependenceScale12Question, String>(CigaretteDependenceScale12Question.values().length);

    public Map<CigaretteDependenceScale12Question, String> getResponse() {
        return response;
    }

    public int getScore() {
        int score = 0;

        final int absoluteScore1 = Integer.parseInt(response.get(CigaretteDependenceScale12Question.ADDICTION));
        score += (int) Math.ceil(absoluteScore1 / 20.0);

        final int absoluteScore2 = Integer.parseInt(response.get(CigaretteDependenceScale12Question.CIGARETTES_PER_DAY));
        if (0 <= absoluteScore2 && absoluteScore2 <= 5) {
            score += 1;
        } else if (6 <= absoluteScore2 && absoluteScore2 <= 10) {
            score += 2;
        } else if (11 <= absoluteScore2 && absoluteScore2 <= 20) {
            score += 3;
        } else if (21 <= absoluteScore2 && absoluteScore2 <= 29) {
            score += 4;
        } else {
            score += 5;
        }

        final int absoluteScore3 = Integer.parseInt(response.get(CigaretteDependenceScale12Question.WAKING_UP));
        if (0 <= absoluteScore2 && absoluteScore2 <= 5) {
            score += 5;
        } else if (6 <= absoluteScore2 && absoluteScore2 <= 15) {
            score += 4;
        } else if (16 <= absoluteScore2 && absoluteScore2 <= 30) {
            score += 3;
        } else if (31 <= absoluteScore2 && absoluteScore2 <= 60) {
            score += 2;
        } else {
            score += 1;
        }

        final CigaretteDependenceScale12PartialAnswer answer4 =
            CigaretteDependenceScale12PartialAnswer.valueOf(response.get(CigaretteDependenceScale12Question.QUITTING));

        switch (answer4) {
            case IMPOSSIBLE:
                score += 5;
                break;
            case VERY_DIFFICULT:
                score += 4;
                break;
            case FAIRLY_DIFFICULT:
                score += 3;
                break;
            case FAIRLY_EASY:
                score += 2;
                break;
            case VERY_EASY:
                score += 1;
                break;
            default:
                throw new IllegalArgumentException("Unknown answer " + answer4);
        }

        score += deriveScoreForQuestionType5Through12(CigaretteDependenceScale12Question.URGE);
        score += deriveScoreForQuestionType5Through12(CigaretteDependenceScale12Question.STRESS);
        score += deriveScoreForQuestionType5Through12(CigaretteDependenceScale12Question.GOING_OUT);
        score += deriveScoreForQuestionType5Through12(CigaretteDependenceScale12Question.PRISONER);
        score += deriveScoreForQuestionType5Through12(CigaretteDependenceScale12Question.TOO_MUCH);
        score += deriveScoreForQuestionType5Through12(CigaretteDependenceScale12Question.BUY);
        score += deriveScoreForQuestionType5Through12(CigaretteDependenceScale12Question.ALL_THE_TIME);
        score += deriveScoreForQuestionType5Through12(CigaretteDependenceScale12Question.RISKS_TO_HEALTH);
    }
}
```

```
        return score;
    }

    private int deriveScoreForQuestionType5Through12(final CigaretteDependenceScale12Question question) {
        final CigaretteDependenceScale12PartialAnswer answer =
            CigaretteDependenceScale12PartialAnswer.valueOf(response.get(question));

        switch (answer) {
            case TOTALLY_DISAGREE:
                return 1;
            case SOMEWHAT_DISAGREE:
                return 2;
            case NEITHER:
                return 3;
            case SOMEWHAT_AGREE:
                return 4;
            case FULLY_AGGREE:
                return 5;
            default:
                throw new IllegalArgumentException("Unknown answer " + answer);
        }
    }

    public void setResponse(final Map<CigaretteDependenceScale12Question, String> response) {
        this.response = response;
    }
}
```

```
package hygeia.bo.pchr.questionnaire;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public enum CigaretteDependenceScale12PartialAnswer {
    IMPOSSIBLE,
    VERY_DIFFICULT,
    FAIRLY_DIFFICULT,
    FAIRLY_EASY,
    VERY_EASY,
    TOTALLY_DISAGREE,
    SOMEWHAT_DISAGREE,
    NEITHER,
    SOMEWHAT_AGREE,
    FULLY_AGGREE,
}
```

```
package hygeia.bo.pchr.questionnaire;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public enum CigaretteDependenceScale12Question {
    ADDICTION,
    CIGARETTES_PER_DAY,
    WAKING_UP,
    QUITTING,
    URGE,
    STRESS,
    GOING_OUT,
    PRISONER,
    TOO_MUCH,
    BUY,
    ALL_THE_TIME,
    RISKS_TO_HEALTH
}
```

```
package hygeia.bo.pchr.questionnaire;

import hygeia.bo.common.DatabaseEntity;
import org.hibernate.annotations.Cascade;
import org.hibernate.annotations.CascadeType;
import org.hibernate.annotations.CollectionOfElements;
import org.hibernate.annotations.MapKey;
import org.hibernate.annotations.Parameter;
import org.hibernate.annotations.Type;
import org.hibernate.validator.NotEmpty;
import org.hibernate.validator.NotNull;

import javax.persistence.Entity;
import javax.persistence.EnumType;
import javax.persistence.Enumerated;
import javax.persistence.FetchType;
import java.util.HashMap;
import java.util.Map;

/**
 * From An Item Response Analysis of the Alcohol Dependence Scale in Treatment-Seeking Alcoholics
 * By Kahler, Strong, Hayaki, Ramsey, and Brown
 * <p/>
 * Sent from Dr. Sean Laraway
 */
```

Heuristic Health Resource Referral (H2R2) Engine

```
* @author Duy B. Vo <duy.vo@students.sjsu.edu>
*/
@Entity
public class EmpiricallyBasedAlcoholDependenceScale extends DatabaseEntity {

    @Cascade(CascadeType.DELETE_ORPHAN)
    @CollectionOfElements(fetch = FetchType.EAGER)
    @Enumerated(EnumType.STRING)
    @MapKey(
        type = @Type(
            type = "org.hibernate.type.EnumType",
            parameters = @Parameter(
                name = "enumClass",
                value = "hygeia.bo.pchr.questionnaire.EmpiricallyBasedAlcoholDependenceScaleQuestion"))
    )
    @NotNull
    @NotEmpty
    private Map<EmpiricallyBasedAlcoholDependenceScaleQuestion, EmpiricallyBasedAlcoholDependenceScaleAnswer> response =
        new HashMap<EmpiricallyBasedAlcoholDependenceScaleQuestion, EmpiricallyBasedAlcoholDependenceScaleAnswer>() {
            EmpiricallyBasedAlcoholDependenceScaleQuestion.values().length);

    public Map<EmpiricallyBasedAlcoholDependenceScaleQuestion, EmpiricallyBasedAlcoholDependenceScaleAnswer> getResponse() {
        return response;
    }

    public void setResponse(
        final Map<EmpiricallyBasedAlcoholDependenceScaleQuestion, EmpiricallyBasedAlcoholDependenceScaleAnswer> response) {
        this.response = response;
    }

    public int deriveTotalScore() {
        int totalScore = 0;
        for (EmpiricallyBasedAlcoholDependenceScaleQuestion question : response.keySet()) {
            totalScore += deriveIndividualScore(question, response.get(question));
        }
        return totalScore;
    }

    private static int deriveIndividualScore(
        final EmpiricallyBasedAlcoholDependenceScaleQuestion question,
        final EmpiricallyBasedAlcoholDependenceScaleAnswer answer) {
        Integer answerValue = null;
        switch (question) {
            case SHAKES:
                return derive1And2As1(question, answer);
            case DELIRIUM:
                return derive1And2As1(question, answer);
            case HALLUCINATIONS:
                return derive1And2As1(question, answer);
            case NOT_HAVING_DRINK:
                return deriveYesNoAnswer(question, answer);
            case BOTTLE_CLOSE:
                return derive1And2As1(question, answer);
            case DRINK_AFTER_ABSTINENCE:
                answerValue = deriveOrdinalAnswerValue(question, answer);
                if (answerValue == 0 || answerValue == 1) {
                    return 0;
                } else if (answerValue == 2) {
                    return 1;
                }
            case PASSING_OUT:
                return derive1And2As1(question, answer);
            case DRINKING_THROUGHOUT:
                return deriveYesNoAnswer(question, answer);
            case HEARTBEAT:
                return derive1And2As1(question, answer);
            case PREOCCUPATION:
                return deriveYesNoAnswer(question, answer);
            case SENSATIONS:
                return derive1And2As1(question, answer);
            case BLACKOUTS:
                answerValue = deriveOrdinalAnswerValue(question, answer);
                if (answerValue == 0 || answerValue == 1) {
                    return 0;
                } else if (answerValue == 2 || answerValue == 3) {
                    return 1;
                }
        }
        throw new IllegalArgumentException(answer + " with value " + answerValue + " not mapped for " + question);
    }

    private static int deriveYesNoAnswer(final EmpiricallyBasedAlcoholDependenceScaleQuestion question, final EmpiricallyBasedAlcoholDependenceScaleAnswer answer) throws
        IllegalArgumentException {
        final int answerValue = deriveOrdinalAnswerValue(question, answer);
        if (answerValue == 0) {
            return 0;
        } else if (answerValue == 1) {
            return 1;
        } else {
            throw new IllegalArgumentException(answer + " with value " + answerValue + " not mapped for " + question);
        }
    }

    private static int derive1And2As1(final EmpiricallyBasedAlcoholDependenceScaleQuestion question, final EmpiricallyBasedAlcoholDependenceScaleAnswer answer) {
        final int answerValue = deriveOrdinalAnswerValue(question, answer);
        if (answerValue == 0) {
```

Heuristic Health Resource Referral (H2R2) Engine

```
        return 0;
    } else if (answerValue == 1 || answerValue == 2) {
        return 1;
    } else {
        throw new IllegalArgumentException(answer + " with value " + answerValue + " not mapped for " + question);
    }
}

private static int deriveOrdinalAnswerValue(final EmpiricallyBasedAlcoholDependenceScaleQuestion question, final EmpiricallyBasedAlcoholDependenceScaleAnswer answer) {
    for (int i = 0; i < question.getPossibleAnswers().length; i++) {
        if (question.getPossibleAnswers()[i] == answer) {
            return i;
        }
    }

    throw new IllegalArgumentException(answer + " not in possible answers for " + question);
}
}
```

```
package hygeia.bo.pchr.questionnaire;
```

```
/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public enum EmpiricallyBasedAlcoholDependenceScaleAnswer {
    NO,
    SOMETIMES,
    OFTEN,
    SEVERAL_TIMES,
    ONCE,
    MOST_OF_TIME,
    ALMOST_EVERY_DRINK,
    MORE_THAN_ONCE,
    ONCE_TWICE,
    BLACKOUT_NONE,
    BLACKOUT_LESS_THAN_ONE_HOUR,
    BLACKOUT_SEVERAL_HOURS,
    BLACKOUT_DAYS,
    YES,
}
```

```
package hygeia.bo.pchr.questionnaire;
```

```
/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public enum EmpiricallyBasedAlcoholDependenceScaleQuestion {
    SHAKES(3, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.SOMETIMES,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.OFTEN),
    DELIRIUM(5, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.SOMETIMES,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.SEVERAL_TIMES),
    HALLUCINATIONS(8, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.ONCE,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.SEVERAL_TIMES),
    NOT_HAVING_DRINK(9, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.YES),
    BOTTLE_CLOSE(11, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.SOMETIMES,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.MOST_OF_TIME),
    DRINK_AFTER_ABSTINENCE(12, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.SOMETIMES,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.ALMOST_EVERY_DRINK),
    PASSING_OUT(13, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.ONCE,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.MORE_THAN_ONCE),
    DRINKING_THROUGHOUT(15, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.YES),
    HEARTBEAT(17, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.ONCE,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.SEVERAL_TIMES),
    PREOCCUPATION(18, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.YES),
    SENSATIONS(20, EmpiricallyBasedAlcoholDependenceScaleAnswer.NO, EmpiricallyBasedAlcoholDependenceScaleAnswer.ONCE_TWICE,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.OFTEN),
    BLACKOUTS(
    22,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.BLACKOUT_NONE,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.BLACKOUT_LESS_THAN_ONE_HOUR,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.BLACKOUT_SEVERAL_HOURS,
    EmpiricallyBasedAlcoholDependenceScaleAnswer.BLACKOUT_DAYS);

    private EmpiricallyBasedAlcoholDependenceScaleQuestion(final int adsQuestionNumber, final EmpiricallyBasedAlcoholDependenceScaleAnswer... possibleAnswers) {
        this.adsQuestionNumber = adsQuestionNumber;
        this.possibleAnswers = possibleAnswers;
    }

    private final int adsQuestionNumber;
    private final EmpiricallyBasedAlcoholDependenceScaleAnswer[] possibleAnswers;

    public int getAdsQuestionNumber() {
        return adsQuestionNumber;
    }

    public EmpiricallyBasedAlcoholDependenceScaleAnswer[] getPossibleAnswers() {
        return possibleAnswers;
    }
}
```

Heuristic Health Resource Referral (H2R2) Engine

```
package hygeia.bo.pchr;

import hygeia.bo.common.DatabaseEntity;
import hygeia.bo.pchr.externalFactor.Consumption;
import hygeia.bo.pchr.questionnaire.AlcoholDependenceScale;
import hygeia.bo.pchr.questionnaire.GHQ28Data;
import hygeia.bo.pchr.questionnaire.CigaretteDependenceScale12;
import hygeia.bo.pchr.questionnaire.EmpiricallyBasedAlcoholDependenceScale;
import hygeia.bo.pchr.questionnaire.GHQ28Data;
import hygeia.bo.pchr.questionnaire.GeriatricDepressionScaleData;
import hygeia.bo.pchr.questionnaire.GoldbergDepressionScaleData;
import hygeia.common.util.bean.HashCodeContributor;

import javax.persistence.CascadeType;
import javax.persistence.Entity;
import javax.persistence.FetchType;
import javax.persistence.OneToOne;
import javax.persistence.Transient;

/**
 * @author Duy B. Vo
 */
@Entity
public class PCHRInformation extends DatabaseEntity {

    @HashCodeContributor
    @OneToOne(cascade = CascadeType.REMOVE, fetch = FetchType.LAZY)
    private WeightTrend weightTrend;

    @HashCodeContributor
    @OneToOne(cascade = CascadeType.REMOVE, fetch = FetchType.LAZY)
    private HeightTrend heightTrend;

    @HashCodeContributor
    @OneToOne(cascade = CascadeType.REMOVE, fetch = FetchType.LAZY)
    private ActivityInformation activityInformation;

    @Transient
    private AlcoholDependenceScale ads;

    public EmpiricallyBasedAlcoholDependenceScale getEmpiricallyBasedAlcoholDependencyScale() {
        return empiricallyBasedAlcoholDependencyScale;
    }

    public void setEmpiricallyBasedAlcoholDependencyScale(
        final EmpiricallyBasedAlcoholDependenceScale empiricallyBasedAlcoholDependencyScale) {
        this.empiricallyBasedAlcoholDependencyScale = empiricallyBasedAlcoholDependencyScale;
    }

    public WeightTrend getWeightTrend() {
        return weightTrend;
    }

    public void setWeightTrend(final WeightTrend weightTrend) {
        this.weightTrend = weightTrend;
    }

    public HeightTrend getHeightTrend() {
        return heightTrend;
    }

    public void setHeightTrend(final HeightTrend heightTrend) {
        this.heightTrend = heightTrend;
    }

    public CigaretteDependenceScale12 getCigaretteDependenceScale() {
        return cigaretteDependenceScale;
    }

    public void setCigaretteDependenceScale(final CigaretteDependenceScale12 cigaretteDependenceScale) {
        this.cigaretteDependenceScale = cigaretteDependenceScale;
    }

    public ActivityInformation getActivityInformation() {
        return activityInformation;
    }

    public void setActivityInformation(final ActivityInformation activityInformation) {
        this.activityInformation = activityInformation;
    }

    public AlcoholDependenceScale getAds() {
        return ads;
    }

    public void setAds(final AlcoholDependenceScale ads) {
        this.ads = ads;
    }

    public GHQ28Data getGhq28Data() {
        return ghq28Data;
    }

    public void setGhq28Data(final GHQ28Data ghq28Data) {
        this.ghq28Data = ghq28Data;
    }
}
```

```
public CGHQ28Data getCghq28Data() {
    return cghq28Data;
}

public void setCghq28Data(final CGHQ28Data cghq28Data) {
    this.cghq28Data = cghq28Data;
}

public Consumption getConsumption() {
    return consumption;
}

public void setConsumption(final Consumption consumption) {
    this.consumption = consumption;
}

public GeriatricDepressionScaleData getGeriatricDepressionScale() {
    return geriatricDepressionScale;
}

public void setGeriatricDepressionScale(final GeriatricDepressionScaleData geriatricDepressionScale) {
    this.geriatricDepressionScale = geriatricDepressionScale;
}

public GoldbergDepressionScaleData getGoldbergDepressionScale() {
    return goldbergDepressionScale;
}

public void setGoldbergDepressionScale(final GoldbergDepressionScaleData goldbergDepressionScale) {
    this.goldbergDepressionScale = goldbergDepressionScale;
}

@Transient
private GHQ28Data ghq28Data;

@HashCodeContributor
@OneToOne(cascade = CascadeType.REMOVE, fetch = FetchType.LAZY)
private CGHQ28Data cghq28Data;

@HashCodeContributor
@OneToOne(cascade = CascadeType.REMOVE, fetch = FetchType.LAZY)
private Consumption consumption;

@HashCodeContributor
@OneToOne(cascade = CascadeType.REMOVE, fetch = FetchType.LAZY)
private GeriatricDepressionScaleData geriatricDepressionScale;

@HashCodeContributor
@OneToOne(cascade = CascadeType.REMOVE, fetch = FetchType.LAZY)
private GoldbergDepressionScaleData goldbergDepressionScale;

@HashCodeContributor
@OneToOne(cascade = CascadeType.REMOVE, fetch = FetchType.LAZY)
private EmpiricallyBasedAlcoholDependenceScale empiricallyBasedAlcoholDependencyScale;

@HashCodeContributor
@OneToOne(cascade = CascadeType.REMOVE, fetch = FetchType.LAZY)
private CigaretteDependenceScale12 cigaretteDependenceScale;
}
```

```
package hygeia.model.pchr.dao;

import hygeia.bo.pchr.externalFactor.Consumption;
import hygeia.model.common.dao.AbstractDao;
import org.springframework.stereotype.Repository;

/**
 * @author Duy B. Vo
 */
@Repository
public class ConsumptionDao extends AbstractDao<Consumption> {
}
```

```
package hygeia.model.pchr.dao;

import hygeia.bo.common.DatabaseEntity;
import hygeia.bo.pchr.PCHRInformation;
import hygeia.model.common.dao.AbstractDao;
import org.springframework.stereotype.Repository;

import java.util.Calendar;
import java.util.LinkedHashSet;
import java.util.Set;

/**
 * @author Duy B. Vo
 */
@Repository
public class PCHRInformationDao extends AbstractDao<PCHRInformation> {
}
```

```
package hygeia.model.pchr.dao.questionnaire;

import hygeia.bo.pchr.questionnaire.CigaretteDependenceScale12;
import hygeia.model.common.dao.AbstractDao;
import org.springframework.stereotype.Repository;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Repository
public class CigaretteDependenceScale12Dao extends AbstractDao<CigaretteDependenceScale12> {
}
```

```
package hygeia.model.pchr.dao.questionnaire;

import hygeia.bo.pchr.questionnaire.EmpiricallyBasedAlcoholDependenceScale;
import hygeia.model.common.dao.AbstractDao;
import org.springframework.stereotype.Repository;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Repository
public class EmpiricallyBasedAlcoholDependenceScaleDao extends AbstractDao<EmpiricallyBasedAlcoholDependenceScale> {
}
```

```
package hygeia.business.pchr.operation;

import hygeia.business.common.operation.HygeiaOperation;
import hygeia.bo.pchr.externalFactor.Consumption;
import hygeia.bo.account.User;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public interface ConsumptionOperation extends HygeiaOperation<Consumption> {

    Consumption getAndCreateForUser(final User owner);
}
```

```
package hygeia.business.pchr.operation;

import hygeia.business.common.operation.HygeiaOperation;
import hygeia.bo.pchr.PCHRInformation;
import hygeia.bo.account.User;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public interface PCHRInformationOperation extends HygeiaOperation<PCHRInformation> {

    PCHRInformation getAndCreateForUser(final User owner);
}
```

```
package hygeia.business.pchr.operation.impl;

import org.springframework.stereotype.Component;
import org.springframework.beans.factory.annotation.Autowired;
import hygeia.business.common.operation.AbstractHygeiaOperation;
import hygeia.business.pchr.operation.ConsumptionOperation;
import hygeia.model.pchr.dao.ConsumptionDao;
import hygeia.bo.pchr.externalFactor.Consumption;
import hygeia.bo.account.User;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Component(value = "hygeia.business.pchr.operation.impl.ConsumptionOperationImpl")
public class ConsumptionOperationImpl
    extends AbstractHygeiaOperation<ConsumptionDao, Consumption> implements ConsumptionOperation {

    @Autowired
    private ConsumptionDao dao;

    public ConsumptionDao getDao() {
        return dao;
    }

    public Consumption getAndCreateForUser(final User owner) {
        Consumption info = getUniqueForUser(owner);
        if (info == null) {
            info = new Consumption();
            saveForUser(owner, info);
        }
        return info;
    }
}
```

Heuristic Health Resource Referral (H2R2) Engine

```
package hygeia.business.pchr.operation.impl;

import hygeia.bo.account.User;
import hygeia.bo.information.IndividualRoleSpecificInformation;
import hygeia.bo.pchr.PCHRInformation;
import hygeia.business.common.operation.AbstractHygeiaOperation;
import hygeia.business.information.operation.IndividualRoleSpecificInformationOperation;
import hygeia.business.pchr.operation.PCHRInformationOperation;
import hygeia.model.pchr.dao.PCHRInformationDao;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Component;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Component(value = "hygeia.business.pchr.operation.impl.PCHRInformationOperationImpl")
public class PCHRInformationOperationImpl
    extends AbstractHygeiaOperation<PCHRInformationDao, PCHRInformation> implements PCHRInformationOperation {

    @Autowired
    private PCHRInformationDao dao;

    @Autowired
    IndividualRoleSpecificInformationOperation individualRoleOperation;

    public PCHRInformationDao getDao() {
        return dao;
    }

    public PCHRInformation getAndCreateForUser(final User owner) {
        PCHRInformation info = getUniqueForUser(owner);
        if (info == null) {
            info = new PCHRInformation();
            saveForUser(owner, info);
            final IndividualRoleSpecificInformation individualRoleInfo = individualRoleOperation.getAndCreateForUser(owner);
            individualRoleInfo.setPchrInformation(info);
            individualRoleOperation.saveForUser(owner, individualRoleInfo);
        }
        return info;
    }
}
```

```
package hygeia.business.pchr.operation.questionnaire;

import hygeia.business.common.operation.HygeiaOperation;
import hygeia.bo.pchr.questionnaire.CigaretteDependenceScale12;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public interface CigaretteDependenceScale12Operation extends HygeiaOperation<CigaretteDependenceScale12> {
}
```

```
package hygeia.business.pchr.operation.questionnaire;

import hygeia.business.common.operation.HygeiaOperation;
import hygeia.bo.pchr.questionnaire.EmpiricallyBasedAlcoholDependenceScale;
import hygeia.bo.account.User;
import org.springframework.stereotype.Component;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Component(value = "hygeia.business.pchr.operation.questionnaire.EmpiricallyBasedAlcoholDependenceScaleOperation")
public interface EmpiricallyBasedAlcoholDependenceScaleOperation
    extends HygeiaOperation<EmpiricallyBasedAlcoholDependenceScale> {
}
```

```
package hygeia.business.pchr.operation.questionnaire.impl;

import hygeia.business.pchr.operation.questionnaire.CigaretteDependenceScale12Operation;
import hygeia.business.common.operation.AbstractHygeiaOperation;
import hygeia.bo.pchr.questionnaire.CigaretteDependenceScale12;
import hygeia.model.pchr.dao.questionnaire.CigaretteDependenceScale12Dao;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Component;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Component(value = "hygeia.business.pchr.operation.questionnaire.impl.CigaretteDependenceScale12OperationImpl")
public class CigaretteDependenceScale12OperationImpl
    extends AbstractHygeiaOperation<CigaretteDependenceScale12Dao, CigaretteDependenceScale12>
    implements CigaretteDependenceScale12Operation {

    @Autowired
    private CigaretteDependenceScale12Dao dao;

    public CigaretteDependenceScale12Dao getDao() {
        return dao;
    }
}
```



```
}  
}
```

```
package hygeia.business.pchr.operation.questionnaire.impl;  
  
import hygeia.business.common.operation.AbstractHygeiaOperation;  
import hygeia.business.pchr.operation.questionnaire.EmpiricallyBasedAlcoholDependenceScaleOperation;  
import hygeia.model.pchr.dao.questionnaire.AlcoholDependenceScaleDao;  
import hygeia.model.pchr.dao.questionnaire.EmpiricallyBasedAlcoholDependenceScaleDao;  
import hygeia.bo.pchr.questionnaire.AlcoholDependenceScale;  
import hygeia.bo.pchr.questionnaire.EmpiricallyBasedAlcoholDependenceScale;  
import hygeia.bo.account.User;  
import org.springframework.beans.factory.annotation.Autowired;  
import org.springframework.stereotype.Component;  
  
/**  
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>  
 */  
@Component(  
    value = "hygeia.business.pchr.operation.questionnaire.impl.EmpiricallyBasedAlcoholDependenceScaleOperationImpl")  
public class EmpiricallyBasedAlcoholDependenceScaleOperationImpl  
    extends AbstractHygeiaOperation<EmpiricallyBasedAlcoholDependenceScaleDao, EmpiricallyBasedAlcoholDependenceScale>  
    implements EmpiricallyBasedAlcoholDependenceScaleOperation {  
  
    @Autowired  
    private EmpiricallyBasedAlcoholDependenceScaleDao dao;  
  
    public EmpiricallyBasedAlcoholDependenceScaleDao getDao() {  
        return dao;  
    }  
}
```

```
package hygeia.bo.account;  
  
import hygeia.bo.common.DatabaseEntity;  
import hygeia.bo.common.user.RoleSpecificInformation;  
import hygeia.bo.common.user.UserRole;  
import hygeia.bo.information.IdentityInformation;  
import hygeia.bo.information.Preferences;  
import hygeia.bo.information.contact.ContactInformation;  
import hygeia.common.util.bean.HashCodeContributor;  
import hygeia.common.util.bean.NonEqualsContributor;  
import hygeia.common.util.bean.NonToStringContributor;  
import org.hibernate.annotations.Cascade;  
import org.hibernate.annotations.CascadeType;  
import org.hibernate.annotations.MapKey;  
import org.hibernate.annotations.NaturalId;  
import org.hibernate.annotations.Parameter;  
import org.hibernate.annotations.Type;  
import org.hibernate.search.annotations.Field;  
import org.hibernate.search.annotations.Index;  
import org.hibernate.search.annotations.Indexed;  
import org.hibernate.search.annotations.IndexedEmbedded;  
import org.hibernate.search.annotations.Store;  
import org.hibernate.validator.NotEmpty;  
import org.hibernate.validator.NotNull;  
  
import javax.persistence.Entity;  
import javax.persistence.FetchType;  
import javax.persistence.ManyToMany;  
import javax.persistence.OneToOne;  
import javax.persistence.Table;  
import javax.persistence.Transient;  
import javax.persistence.UniqueConstraint;  
import java.security.Permissions;  
import java.util.Map;  
  
/**  
 * @author Duy B. Vo  
 */  
@Entity  
@Indexed  
@Table(  
    name = "HygeiaUser",  
    uniqueConstraints = {@UniqueConstraint(columnNames = {"username"})})  
public class User extends DatabaseEntity {  
  
    public Map.Entry<UserRole, RoleSpecificInformation> getPrimaryRoleWithRoleInformation() {  
        Map.Entry<UserRole, RoleSpecificInformation> primaryRoleWithInfo = null;  
        for (Map.Entry<UserRole, RoleSpecificInformation> entry : roleInformation.entrySet()) {  
            if (entry.getValue().isPrimary != null && entry.getValue().isPrimary) {  
                primaryRoleWithInfo = entry;  
            }  
        }  
        return primaryRoleWithInfo;  
    }  
  
    public String getUsername() {  
        return username;  
    }  
  
    public void setUsername(final String username) {  
        this.username = username;  
    }  
}
```

```
}

public String getPasswordHash() {
    return passwordHash;
}

public void setPasswordHash(final String passwordHash) {
    this.passwordHash = passwordHash;
}

public Map<UserRole, RoleSpecificInformation> getRoleInformation() {
    return roleInformation;
}

public RoleSpecificInformation getRoleSpecificInformation(final UserRole userRole) {
    if (roleInformation == null) {
        return null;
    } else {
        return roleInformation.get(userRole);
    }
}

public void setRoleInformation(final Map<UserRole, RoleSpecificInformation> roleInformation) {
    this.roleInformation = roleInformation;
}

public ContactInformation getContactInformation() {
    return contactInformation;
}

public void setContactInformation(final ContactInformation contactInformation) {
    this.contactInformation = contactInformation;
}

public IdentityInformation getIdentityInformation() {
    return identityInformation;
}

public void setIdentityInformation(final IdentityInformation identityInformation) {
    this.identityInformation = identityInformation;
}

public Preferences getPreferences() {
    return preferences;
}

public void setPreferences(final Preferences preferences) {
    this.preferences = preferences;
}

public String getNonce() {
    return nonce;
}

public void setNonce(final String nonce) {
    this.nonce = nonce;
}

@Field(index= Index.TOKENIZED, store= Store.NO)
@HashCodeContributor
@NaturalId
@NotNull
private String username;

@NotNull
@NonToStringContributor
private String passwordHash;

@NotNull
@NonToStringContributor
private String nonce;

@Cascade(CascadeType.DELETE_ORPHAN)
@ManyToOne(fetch = FetchType.EAGER)
@MapKey(
    type = @Type(
        type = "org.hibernate.type.EnumType",
        parameters = @Parameter(name = "enumClass", value = "hygeia.bo.common.user.UserRole")))
@NotEmpty
@NonEqualsContributor
@NotNull
@NonToStringContributor
private Map<UserRole, RoleSpecificInformation> roleInformation;

@OneToOne(fetch = FetchType.LAZY)
private ContactInformation contactInformation;

@HashCodeContributor
@IndexedEmbedded
@NotNull
@OneToOne(fetch = FetchType.LAZY)
private IdentityInformation identityInformation;

@OneToOne(fetch = FetchType.EAGER)
private Preferences preferences;
```

Heuristic Health Resource Referral (H2R2) Engine

```
@Transient
public Map<String, Permissions> permissions;
}

package hygeia.model.account.dao;

import hygeia.bo.account.User;
import hygeia.bo.information.IdentityInformation;
import hygeia.bo.information.IndividualRoleSpecificInformation;
import hygeia.bo.common.security.AccessControlData;
import hygeia.bo.common.user.UserRole;
import hygeia.bo.common.user.RoleSpecificInformation;
import hygeia.common.util.EncryptionUtil;
import hygeia.model.common.dao.AbstractDao;
import hygeia.model.information.dao.IdentityInformationDao;
import hygeia.model.information.dao.IndividualRoleSpecificInformationDao;
import hygeia.aspect.security.HygeiaAuthenticationToken;
import hygeia.aspect.ApplicationContext;
import org.apache.commons.lang.StringUtils;
import org.apache.lucene.analysis.standard.StandardAnalyzer;
import org.apache.lucene.queryParser.MultiFieldQueryParser;
import org.apache.lucene.queryParser.ParseException;
import org.apache.lucene.search.Query;
import org.hibernate.Criteria;
import org.hibernate.Transaction;
import org.hibernate.criterion.Expression;
import org.hibernate.search.FullTextSession;
import org.hibernate.search.Search;
import org.springframework.stereotype.Repository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.security.context.SecurityContextHolder;

import javax.security.auth.login.AccountNotFoundException;
import javax.security.auth.login.FailedLoginException;
import java.util.LinkedHashSet;
import java.util.List;
import java.util.Set;
import java.util.HashMap;
import java.util.Arrays;
import java.util.HashSet;
import java.util.Map;
import java.util.HashMap;

/**
 * @author Duy B. Vo
 */
@Repository
public class UserDao extends AbstractDao<User> {
    public UserDao() {
    }

    public User retrieveUser(final String username) {
        final Criteria crit = getCurrentSession().createCriteria(User.class);
        crit.add(Expression.eq("username", username).ignoreCase());
        return (User)crit.uniqueResult();
    }

    @SuppressWarnings("unchecked")
    public Set<User> searchForUsers(final String username, final IdentityInformation identityInformation) {
        final Criteria crit = getCurrentSession().createCriteria(User.class);

        if (!StringUtils.isBlank(username)) {
            crit.add(Expression.eq("username", username));
        }

        if (identityInformation != null) {
            crit.add(Expression.eq("identityInformation", identityInformation));
        }

        return new LinkedHashSet<User>(crit.list());
    }

    @SuppressWarnings("unchecked")
    public Set<User> searchForUsers(final String queryString) throws ParseException {
        final FullTextSession fullTextSession = Search.createFullTextSession(getCurrentSession());
        final Transaction transaction = fullTextSession.beginTransaction();
        final MultiFieldQueryParser parser =
            new MultiFieldQueryParser(
                new String[] {
                    "username",
                    "identityInformation.firstName",
                    "identityInformation.middleName",
                    "identityInformation.lastName"
                },
                new StandardAnalyzer());
        final Query luceneQuery = parser.parse(queryString);
        final org.hibernate.Query hibQuery =
            fullTextSession.createFullTextQuery(luceneQuery, User.class);
        final List result = hibQuery.list();
        transaction.commit();
        return new LinkedHashSet<User>(result);
    }

    public User retrieveAuthenticatedUser(final String username, final String plaintextPassword)
```

```
throws AccountNotFoundException, FailedLoginException {
    final Criteria crit = getCurrentSession().createCriteria(User.class);
    crit.add(Expression.eq("username", username).ignoreCase());

    //Find a user with the given username
    final User userWithGivenUsername = (User)crit.uniqueResult();

    //Validate password
    if (userWithGivenUsername != null) {
        final String derivedHash =
            EncryptionUtil.generatePasswordAndNonceHex(plaintextPassword, userWithGivenUsername.getNonce())[0];
        if (userWithGivenUsername.getPasswordHash().equals(derivedHash)) {
            return userWithGivenUsername;
        } else {
            throw new FailedLoginException("Invalid password for user " + username);
        }
    } else {
        throw new AccountNotFoundException("Cannot find account with username " + username);
    }
}

public boolean isUniqueUsername(final String username) {
    final LinkedHashMap<String, String> criteriaMap = new LinkedHashMap<String, String>(1);
    criteriaMap.put("username", username);
    final Long count = getCount(criteriaMap);
    return count == 0;
}

public User registerUser(final User user) {
    SecurityContextHolder.getContext().setAuthentication(
        new HygeiaAuthenticationToken(ApplicationContextHolder.getAdminUser()));
    final AccessControlData accessControlData = new AccessControlData();
    accessControlData.setOperatorUsername(user.getUsername());
    accessControlData.setReadable(true);
    accessControlData.setWritable(true);
    user.getIdentityInformation().setAccessControlData(
        new HashSet<AccessControlData>(Arrays.asList(accessControlData)));
    idDao.createOrUpdateEntity(user.getUsername(), user.getIdentityInformation());
    user.setIdentityInformation(user.getIdentityInformation());
    createOrUpdateEntity(user.getUsername(), user);

    final IndividualRoleSpecificInformation individualRoleInfo = new IndividualRoleSpecificInformation();
    individualRoleInfo.isPrimary = true;
    individualRoleDao.createOrUpdateEntity(user.getUsername(), individualRoleInfo);
    final Map<UserRole, RoleSpecificInformation> roleInfo = new HashMap<UserRole, RoleSpecificInformation>(1);
    roleInfo.put(UserRole.INDIVIDUAL_USER, individualRoleInfo);
    user.setRoleInformation(roleInfo);
    return user;
}

@Autowired
private IdentityInformationDao idDao;

@Autowired
private IndividualRoleSpecificInformationDao individualRoleDao;
}
```

```
package hygeia.business.account.operation;

import hygeia.bo.account.User;
import hygeia.bo.common.user.UserRole;
import hygeia.business.account.UserSearchOperation;
import hygeia.business.common.operation.HygeiaOperation;
import hygeia.model.account.dao.UserDao;

import javax.security.auth.login.AccountNotFoundException;
import javax.security.auth.login.FailedLoginException;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
public interface UserOperation extends UserSearchOperation, HygeiaOperation<User> {
    User login(final String username, final String cleartextPassword)
        throws AccountNotFoundException, FailedLoginException;

    UserRole getPrimaryRoleForUser(final User user);

    User getUser(final String username);

    void saveForUser(final User owner, final User entity);

    boolean isUniqueUsername(final String username);

    User registerUser(final User userToBeRegistered, final String passwordClearText);
}
```

```
package hygeia.business.common.operation;

import hygeia.bo.common.DatabaseEntity;
import hygeia.bo.account.User;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
```

```
*/
public interface HygeiaOperation<E extends DatabaseEntity> {
    E getUniqueForUser(final User owner);

    void saveForUser(final User owner, final E entity);
}

package hygeia.business.account.operation.impl;

import hygeia.aspect.logging.BusinessAuditLog;
import hygeia.bo.account.User;
import hygeia.bo.common.user.RoleSpecificInformation;
import hygeia.bo.common.user.UserRole;
import hygeia.business.account.operation.UserOperation;
import hygeia.business.common.operation.AbstractHygeiaOperation;
import hygeia.common.util.EncryptionUtil;
import hygeia.model.account.dao.UserDao;
import org.apache.commons.lang.StringUtils;
import org.apache.lucene.queryParser.ParseException;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Component;
import org.springframework.transaction.annotation.Propagation;
import org.springframework.transaction.annotation.Transactional;

import javax.security.auth.login.AccountNotFoundException;
import javax.security.auth.login.FailedLoginException;
import java.util.Map;
import java.util.Set;

/**
 * @author Duy B. Vo <duy.vo@students.sjsu.edu>
 */
@Component(value = "hygeia.business.account.operation.impl.UserOperationImpl")
public class UserOperationImpl extends AbstractHygeiaOperation<UserDao, User> implements UserOperation {
    @Autowired
    private UserDao dao;

    @BusinessAuditLog
    @Transactional(propagation = Propagation.REQUIRES_NEW, readOnly = true)
    public User login(final String username, final String cleartextPassword)
        throws AccountNotFoundException, FailedLoginException {
        return getDao().retrieveAuthenticatedUser(username, cleartextPassword);
    }

    public void setDao(final UserDao userDao) {
        this.dao = userDao;
    }

    public UserDao getDao() {
        return dao;
    }

    @Transactional
    public UserRole getPrimaryRoleForUser(final User user) {
        final User retrievedUser = getDao().retrieveUser(user.getUsername());
        final Map<UserRole, RoleSpecificInformation> roleInformation = retrievedUser.getRoleInformation();
        for (UserRole userRole : roleInformation.keySet()) {
            final RoleSpecificInformation info = roleInformation.get(userRole);
            if (info.isPrimary != null && info.isPrimary) {
                return userRole;
            }
        }

        return null;
    }

    @Transactional
    public Set<User> getUsers(final String searchCriteria) {
        if (searchCriteria == null) {
            return getDao().retrieveEntities(null, null);
        } else {
            try {
                return getDao().searchForUsers(searchCriteria);
            } catch (ParseException e) {
                throw new IllegalArgumentException(e);
            }
        }
    }

    @Transactional
    public User getUser(final String username) {
        return getDao().retrieveUser(username);
    }

    @Transactional
    public void saveForUser(final User owner, final User entity) {
        getDao().createOrUpdateEntity(owner.getUsername(), entity);
    }

    private static boolean doAddUser(
        final User user, final UserSearchCriteria searchCriteria) {
        if (searchCriteria == null) {
            return true;
        } else {

```

```
if (!StringUtils.isBlank(searchCriteria.firstName)) {
    if (searchCriteria.firstName.equalsIgnoreCase(user.getIdentityInformation().getFirstName())) {
        return true;
    }
}

if (!StringUtils.isBlank(searchCriteria.lastName)) {
    if (searchCriteria.lastName.equalsIgnoreCase(user.getIdentityInformation().getLastName())) {
        return true;
    }
}

if (!StringUtils.isBlank(searchCriteria.username)) {
    if (searchCriteria.username.equalsIgnoreCase(user.getUsername())) {
        return true;
    }
}
}

return false;
}

@Transactional(readOnly = true)
public boolean isUniqueUsername(final String username) {
    return dao.isUniqueUsername(username);
}

@Transactional
public User registerUser(final User userToBeRegistered, final String passwordClearText) {
    getLogger().info("Attempting to register " + userToBeRegistered.getUsername());
    final String[] passwordAndNonce = EncryptionUtil.generatePasswordAndNonceHex(passwordClearText, null);
    userToBeRegistered.setPasswordHash(passwordAndNonce[0]);
    userToBeRegistered.setNonce(passwordAndNonce[1]);
    final User registeredUser = dao.registerUser(userToBeRegistered);
    return registeredUser;
}
}
```

```
package hygeia.business.common.operation;

import hygeia.bo.common.DatabaseEntity;
import hygeia.bo.common.user.UserRole;
import hygeia.bo.common.user.RoleSpecificInformation;
import hygeia.bo.account.User;
import hygeia.model.common.dao.AbstractDao;
import hygeia.aspect.logging.BusinessAuditLog;

import java.util.Map;

import org.springframework.transaction.annotation.Transactional;
import org.springframework.stereotype.Component;
import org.apache.log4j.Logger;
import org.apache.log4j.LogManager;

/**
 * @author Duy B. Vo
 */
@Component(value = "hygeia.business.common.operation.AbstractHygeiaOperation")
public abstract class AbstractHygeiaOperation<D extends AbstractDao<E>, E extends DatabaseEntity>
    implements HygeiaOperation<E> {

    @BusinessAuditLog
    public E getUniqueForUser(final User owner) {
        return getDao().retrieveEntityForUser(owner.getUsername());
    }

    @BusinessAuditLog
    @Transactional
    public void saveForUser(final User owner, final E entity) {
        getDao().createOrUpdateEntity(owner.getUsername(), entity);
    }

    protected abstract D getDao();

    protected String getUsername() {
        return "admin";
    }

    protected Logger getLogger() {
        if (logger == null) {
            logger = LogManager.getLogger(getClass());
        }

        return logger;
    }

    private Logger logger;
}
```